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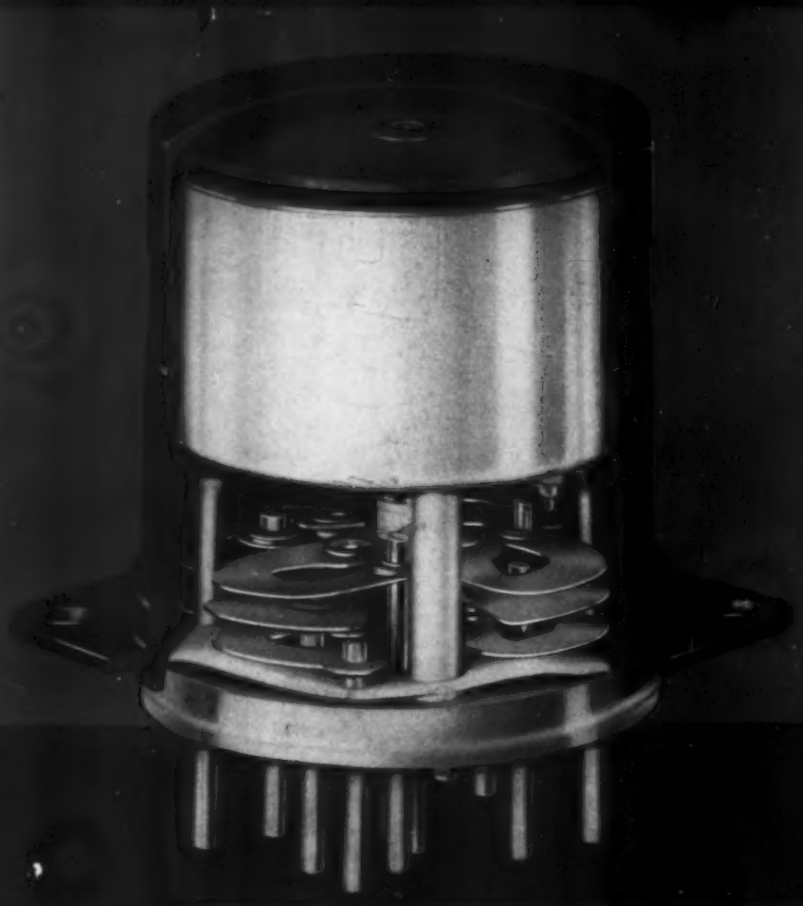

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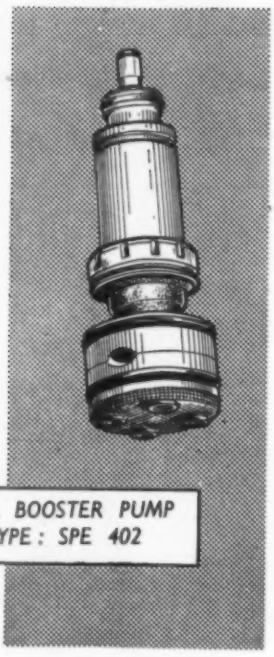

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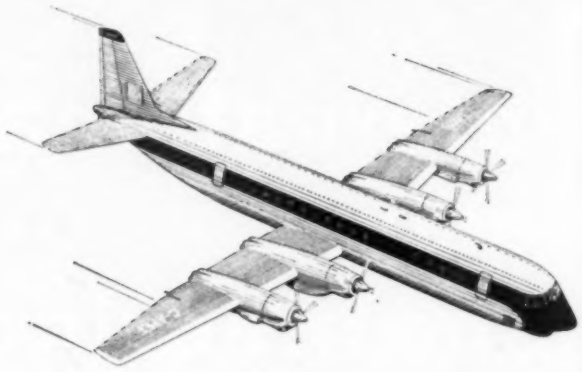

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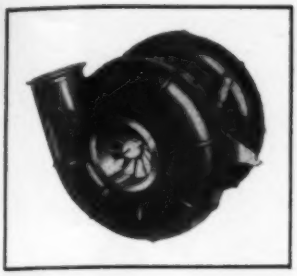

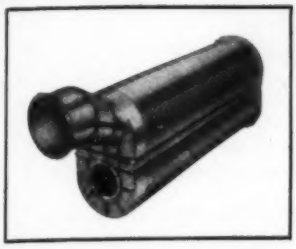

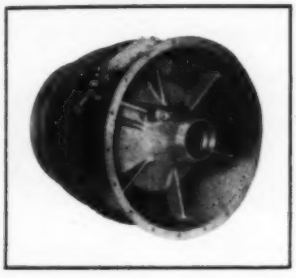

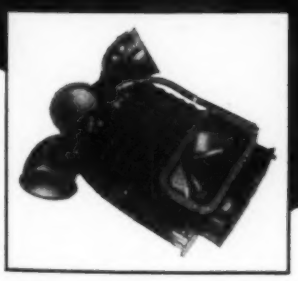

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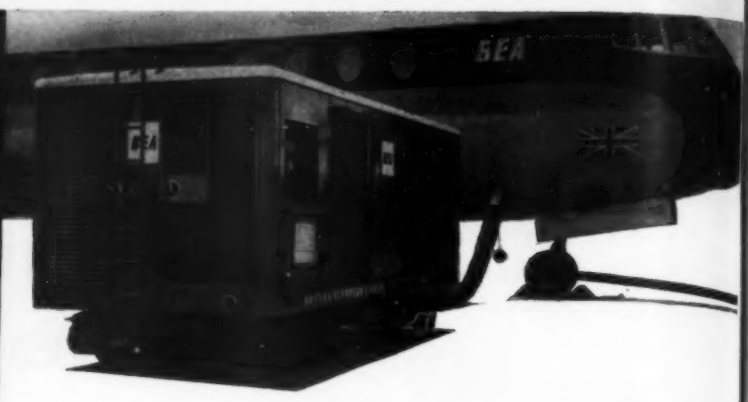

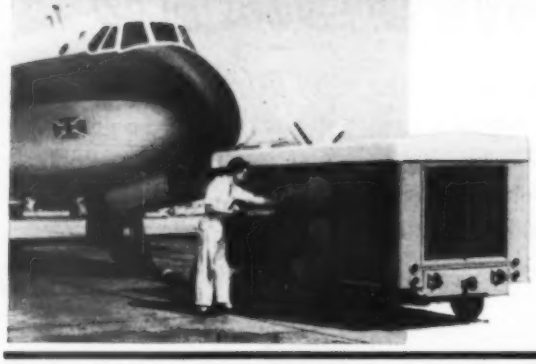

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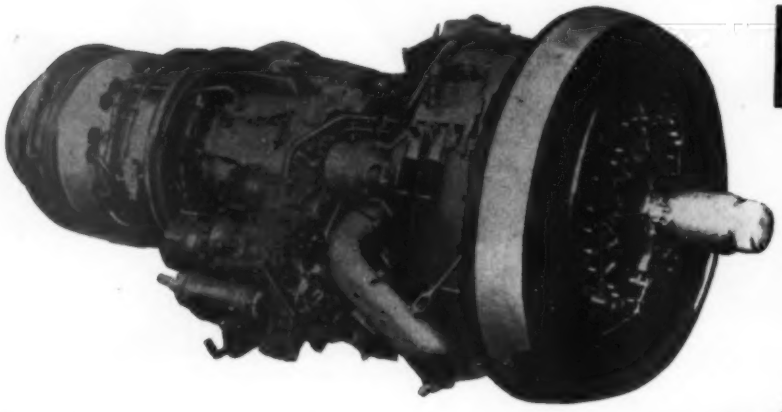

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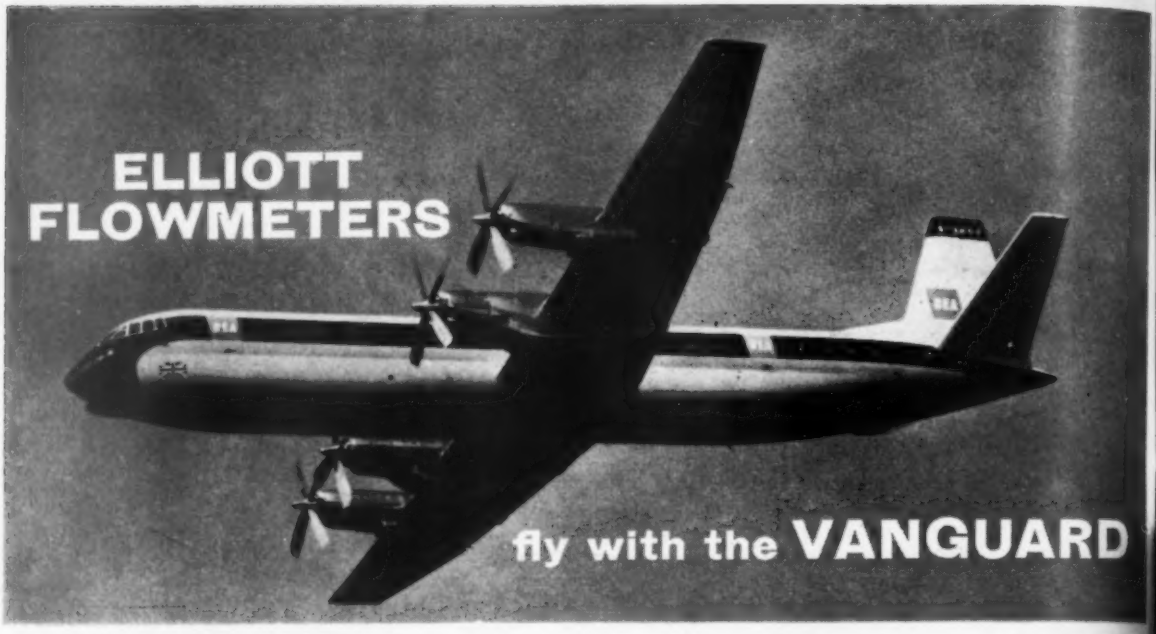

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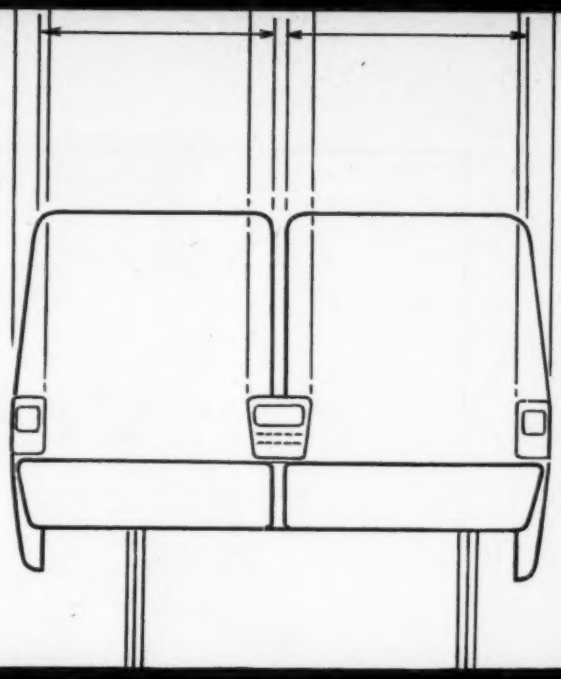

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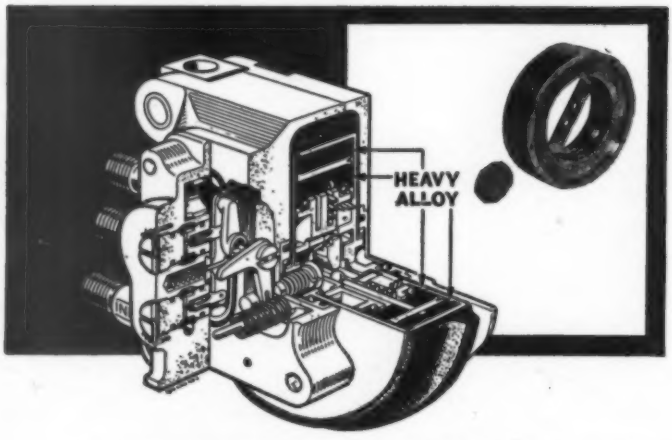

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The inset illustration shows one of the heavy alloy flywheels for the Maxaret automatic brake control unit. Its size can be judged by comparison with the 3d piece.

For comprehensive information on the use of G.E.C. heavy alloy, send for publication No. 4986, 1960.

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No 2712 VOLUME 79 FRIDAY 3 MARCH 1961

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Best in the World

EVERY so often we record in this journal some incontrovertible British "first" or "best." It is a wonderful tonic for morale, and not least so when we are able to report that the RAF has the best fighter in the world. We well remember our account of a visit to No 111 Squadron shortly after its re-equipment with Hurricanes. "There is no doubt whatever," we declared, "that No 111 is, at the moment, the most formidable fighter squadron in the world." There were no two ways about it. And later, of the Spitfire, we were able to write (a little cautiously is seems, after the passage of time): "In these days it is a matter of extreme difficulty to ascertain which is the fastest military aircraft in the world in any particular category. It seems fairly certain, however, that the Vickers-Supermarine Spitfire eight-gun single-seater fighter is the fastest standard fighting machine now on issue to any air force."

Now, once again we are able to report on the RAF's latest fighting equipment —the English Electric Lightning all-weather intercepter—by recording a pronouncement by the Commanding Officer of No 74 Squadron, the first to be equipped: "We know," he says, "we can catch the bombers, and we know we can outfight any fighter equivalent to the USAF Century-series. The performance of the aircraft, coupled with the ease with which it is flown, gives the pilots confidence, and the fact that it is felt to be the best fighter in operational service in the world today gives our Lightning pilots the highest possible morale."

In the Headlines

To the Information Division of the Air Ministry and to the national Press high praise is due for ensuring that these comments, together with some other striking first-hand accounts of the Lightning's capabilities, were duly brought to the notice of the British public. The aircraft not only made the headlines but the placards in London's West End. Yet comment by the air correspondents was not uncritical. One observer—no hand-out swallower—having praised the aircraft and its Ferranti Airpass radar ("by all accounts superlative"), saw fit to comment that hard training, good pilots, excellent machines and high morale could still do little against the argument that if the Lightnings were good enough to stop the bombers an enemy would use missiles, and if they were not good enough to stop the bombers they seemed hardly worth having. Having said which, he was constrained to add: "They are still needed, however, to interrogate, to stop intruders and to maintain British sovereignty over British air space." Even more perceptively he observed that other benefits would be drawn over the years from a 1,500-m.p.h. flying platform and men who could handle it with skill.

It is worth considering the Lightning in the context of a recent declaration by the director of the SBAC. Mr Bowyer examined the aircraft industry in relation to the national economy under four heads: contribution to the defence of the UK and its interests overseas; contribution to export trade; the industry's role as a spearhead or pathfinder in national technological progress; and the part played by the industry in stimulating technical education. Under the first head it is unnecessary to comment further on this page. Under the second, comment is certainly in order, for the only discouraging aspect of the Lightning programme is failure to sell the aircraft abroad. This is not through want of effort, and not altogether surprising, for it is costly, relatively complicated and not everyone's idea of what a fighter should be. But spearhead and pathfinder it assuredly is; and in respect of technical education it represents a continuing exercise in technology for many vital sections of the industry. In more than one respect the Lightning is a useful tool to have around.

FROM ALL QUARTERS

STATE EXECUTIVE: The Minister of Aviation, Mr Peter Thorneycroft, shakes hands with Gp Capt Trumble, Senior RAF Officer Northern Ireland, before leaving RAF Aldergrove for Bishops Court recently. The Minister flew in a Queen Air, made available by the Light Aircraft Division of Short Bros & Harland, distributors for Beechcraft in the British Isles. With back to camera is Mr Ken Dunlop of Shorts

Mutual Replenishment

UNDER Operation Flood Tide, a joint RAF-USAF in-flight refuelling test, fuel has been successfully transferred between tanker and receiver aircraft of both forces: a Valiant has refuelled a B-66, F-100 and F-101; a Valiant and Javelin have received from a KB-50. The flying was carried out from Sculthorpe, where the USAF 47th Bomb Wing is based, and had been preceded by ground tests at Boscombe Down.

In the first phase of the airborne tests, 66 contacts were made between the Valiant tanker and B-66, F-100 and F-101 receivers, with a total transfer of 77,200lb of fuel. Preliminary figures for the second phase showed a total of 76 contacts between the KB-50, Valiant and Javelin, involving a transfer of 50,000lb of fuel—though many of the contacts were made without transfer.

Australia-UK Record Attempt

AN Australian-built Mustang is due to land at London Airport today (Friday), if racing-driver Ron Flockhart's bid to beat the record for an Australia-UK flight has been successful. He was leaving Sydney last Tuesday to fly via Alice Springs, Darwin, Baucau (Portuguese Timor), Singapore, Rangoon, Calcutta, Karachi, Bahrein, Beirut, Brindisi, Nice, with short overnight stops at Singapore, Karachi and Brindisi.

The existing Australian-UK record—5 days, 4hr 21min—was set up by H. F. Broadbent in a Vega Gull in 1938. He flew from Darwin to Lympne, 9,612 miles. Flockhart's distance is 11,500 miles.

Future Perspective

A WORLD-WIDE extension of cheap air fares, greater international co-operation on major aircraft projects, avoidance of any reduction in aeronautical research and the need for a clearer idea of future requirements are points made in a pamphlet published this week. Called *The Making of Aircraft*,* it has been written by Mr Guy Hadley, secretary to the Conservative Parliamentary Aviation Committee. The publishers (Conservative Political Centre) stress that the document is "a personal contribution to discussion and not an official Party pronouncement."

Of cheaper fares, the writer says that only by their general adoption can the much-needed expansion of air transport be achieved. On co-operation, he points out that the cost and complexity of new aircraft may compel manufacturers at home and abroad to pool their resources on major projects. He suggests that large Government grants for research are not "subsidies which keep the aircraft industry alive by artificial feeding," but Government contracts for aviation products vital to our national defence. The aircraft industry itself makes an investment in research and development for civil aircraft "at least equal to the Government contribution." On future requirements, the pamphlet criticizes both Government and BOAC for ordering overlapping types of aircraft; it suggests that the research staff the Corporation needs to plan its future requirements might be strengthened. Recent mergers in the industry should help to obviate delays which in the past have sometimes prevented the appearance of "the right British aircraft at the right moment."

*"*The Making of Aircraft" (24 pages, price 1s) is obtainable from the Conservative Political Centre, 32 Smith Square, London SW1, and from the Conservative Political Centre Bookshop, 6 Victoria Street, SW1.*

Operation Rallye Forges Ahead

THE production prototype Morane Rallye, with extensively altered fuselage, is now flying. A 44 per cent increase in orders during the last month brings the total of orders to 240, so the initial batch of 250 is virtually allocated. Licence production or assembly in the USA is being discussed and de Havilland Australia have agreed to assemble and fit engines in Rallyes supplied from France; they will also provide sales and service. The first production 100 h.p. Rallye is to go to Australia in April. Exclusive Swiss agents are the Transair company of Neuchâtel.

Assisting BEAGLE Design

BEAGLE (British Executive and General Aviation Ltd) have announced four consultative and executive appointments. Prof A. D. Young, MA, FRAeS, AFIAS, professor of aeronautical engineering at Queen Mary College, University of London, and formerly professor of aerodynamics at Cranfield, has been made consultant in aerodynamics to the group. Prof Misha Black, OBE, RDI, FPSIA, a senior partner in Design Research Unit, becomes the group's consultant in industrial design and has already started work on BEAGLE aircraft. Mr Marcus Langley, FRAeS, MIMechE, who was made consulting engineer to the BEAGLE group last November and is a director of Tiltman Langley Ltd, has been appointed technical director of BEAGLE-Auster Aircraft Ltd. Mr T. D. R. Carroll, DFC, AFRAeS, AFIAS, since 1955 deputy design manager with Bristol Aircraft, has been appointed deputy chief designer, British Executive and General Aviation Ltd.

Mr Langley

Mr Carroll

More Marconi Radar for Sweden

A FURTHER contract, worth £1,700,000, has been placed with Marconi by the Royal Swedish Air Board for radar defence system equipment. This latest installation will allow filtered radar targets to be tracked, coded, indentified and fed into a memory bank from which information for synthetic displays of various kinds will be drawn. Information on defensive dispositions will also be presented, using both black-and-white television and colour

GREETINGS to "Flight" accompanied this striking picture of a Sud Aquilon (DH Sea Venom licence) over the carrier "Clemenceau," with the message: "Best wishes to the team of 'Flight.' May it continue to give us every week a perfect picture of aeronautical activities. Ilème Flottille de Chasse (11th Fighter Plane Flotilla)"

REVERSE SEATING is now available in the 1960-61 Model 50 Beechcraft Twin Bonanza by virtue of a kit. Here the two centre chairs are shown in the reverse position. The effect is to make more room and "to suggest a separate pilot's compartment"

OPERATION RALLYE: The production version of the Morane Rallye, referred to opposite, flying in the Paris area. Note the enlarged cabin, swept fin and partly faired undercarriage (see news item, opposite)

projection and a "magic carpet" display which will present analysed targets in sequence for action by human controllers.

When intercepters or missiles are alerted, appropriate information on the target and the best interception course will be automatically extracted from the memory bank, up-dated, and transmitted to missile sites or airfields. Information will be automatically displayed in aircraft cockpits. Remote synthetic displays are also provided for civil defence and civil ATC.

MR LESLIE G. MARSHALL, appointed assistant general manager of the Light Aircraft Engine Department of the Rolls-Royce Motor Car Division at Crewe, will be concerned with Continental engines (licence-manufacture of which by the company was announced last November). He joined Rolls-Royce in 1939 and until his new appointment was contracts manager handling sales of military engines for ground equipment

Nuclear Flying-boats?

SPEAKING from his long experience of maritime aviation, and not in his official capacity as AOC-in-C Coastal Command, Air Marshal Sir Edward Chilton expressed some optimism about the future for flying-boats at the closing-down ceremony of RAF Calshot last week.

"When the nuclear engine is ready for aircraft I think the flying-boat would be an ideal machine in which to use it," he said. "A flying-boat so powered could fly non-stop between the UK and Australia; it could select its route and would not be tied to airfields in unfriendly hands."

Within sight of the two Saunders-Roe Princesses, engineless and Cocooned, Sir Edward commented: "I do not believe that the flying-boat is finished. It is regrettable that the engine manufacturers failed to produce the right engines for the Princesses, though the problem is to find the necessary money for them and also the route on which to employ them.

"I look back with a certain amount of regret to six or seven years ago, when it would have been possible to put in hand the development of a military flying-boat for Britain for about £4m. In the result, we do not have one; and hence the closure of Calshot today."

EEA Starts A New Year

INTENSIVE export efforts by the British electronics industry were the theme of a speech made last week by Mr L. T. Hinton, retiring chairman of the Electronic Engineering Association. Speaking at the Association's annual luncheon in London, he said that the members had done well both in the value of actual exports and in invisible exports. The association had for some time run a commercial committee, which spent half its time on exports. Military attachés going to foreign posts had been briefed on electronics; the Electronic Forum for Industry, the Instruments, Electronics and Automation Exhibition and the Computer Exhibition (to be repeated this year) had proved useful; and annual reviews and bulletins had played their part in publicity.

To Mr Orr-Ewing, Civil Lord of the Admiralty and guest of honour, Mr Hinton appealed for the continued improvement of Government statistical surveys, for early information on other governments' requirements and for representation on inter-government meetings and for the appointment of "electronic attachés" as well as military and commercial ones.

In his reply for the guests Mr Orr-Ewing mentioned that the cost of ancillary equipment for aircraft and ships was steadily rising: it was 5 per cent for the Scimitar, 14 per cent for the Sea Vixen, 20 per cent for the Buccaneer and 23 per cent for a Leander-class frigate. Because we could not afford many projects in the £100m class, co-operation on a national or international basis was necessary.

Elected to succeed Mr Hinton as chairman of the EEA was Dr D. N. Truscott of G.E.C. The new vice-chairman is Mr R. R. C. Rankin of Mullard Equipment.

IN BRIEF

An attempt to launch into orbit an S-45 ionospheric beacon satellite by the US National Aeronautics and Space Administration was unsuccessful on February 24 following an upper-stage failure in the Juno 2 launching vehicle.

On February 20 the US Navy named Boeing Vertol as the winner of the recent competition for a troop and cargo assault helicopter for use by the Marine Corps. Presumably derived from the Model 107, it will be a tandem-rotor machine powered by two GE T58-8 engines, and having all-weather and shipboard capabilities.

Radio signals were transmitted from Jodrell Bank, Cheshire, reflected from the surface of the Moon and received at Sydney, Australia, on February 24. The personnel involved came from Pye Telecommunications, the Nuffield Radio Astronomy Laboratories at Jodrell Bank and the radio astronomy observatory of Sydney University.

British aircraft firms in the UK pavilion at the Rand Easter Show, South Africa's premier annual trade and agricultural fair, being held from March 21 to April 3. British Aircraft Corporation, Bristol Siddeley, Handley Page, Rolls-Royce, Hawker Siddeley, Short Brothers and Westland are displaying models of aircraft and engines.

The total estimated value of orders placed by the MoA since April 1, 1958, for research and for the development and production of aircraft for civil and military purposes is about £700m. This was stated recently in the Commons by the Parliamentary Secretary, Mr Geoffrey Rippon. Of this amount, about £200m was in respect of research and development contracts.

LOADING TRIALS: More than 30 different Army vehicles (some still secret) were tried for size in a mock-up of the Argosy C.1 at AWA's Baginton factory recently. Among visitors who saw the "marginal" vehicles being successfully loaded were (l. to r.) Air Marshal R. B. Lees (Deputy Chief of the Air Staff), Lt-Gen Sir Harold E. Pyman (Deputy Chief of the Imperial General Staff) and Air Cdre G. T. B. Clayton, Director of Operations (Air Transport and Overseas). With them is Mr L. T. Naylor, AWA's cargo systems adviser

Cape Canaveral, February 1: First flight of USAF three-stage Minuteman ICBM. Guidance system fitted, 4,200 miles achieved (see February 10 issue)

Cape Canaveral, February 10: Flight of USAF J-series advanced Titan ICBM with Atlas-type GE Mk 3 nosecone. Distance of 5,000 miles achieved. Two previous shots failed

Vandenberg Air Force Base, February 17: Launch of USAF Discoverer 20 satellite into polar orbit by Thor-Agena B. Data-capsule recovery attempt initially planned for February 21, later cancelled

Missiles and Spaceflight

MERCURY MA-2 SUCCESS

Launched by Atlas from Cape Canaveral on February 21, an unmanned Mercury capsule made a ballistic flight of 1,425 miles down the Atlantic Missile Range in what was described by the National Aeronautics and Space Administration as "the most severe test of the Mercury program." The prime purpose of the test was to qualify the spacecraft design and structure under the worst conceivable re-entry conditions, and a parallel objective was to investigate the compatibility of the spacecraft and the Atlas.

The planned flight curve was chosen to duplicate the most severe re-entry path the capsule could take following an emergency abort during an orbital launch attempt. This was to give a re-entry heating rate 30 per cent higher than that of a normal Mercury orbital re-entry; three times the normal Mercury orbital re-entry air loads, reaching some 900lb per sq ft; and twice the expected deceleration—16g instead of 8g. Maximum planned altitude was 115 miles, range about 1,400 miles, and speed approximately 13,000 m.p.h. The maximum altitude and speed actually achieved were 107 miles and about 12,850 m.p.h.

Designated MA-2, the February 21 launch had much the same purpose as the unsuccessful MA-1 firing of July 29, 1960, which ended with an explosion in the Atlas 65sec after lift-off. Since that date, a thorough analysis of the MA-1 flight data has been made, but has failed to identify the cause of the MA-1 malfunction.

As a result of a comprehensive testing programme, changes were made in the Atlas vehicle used in the MA-2 shot. The adapter ring between the Atlas vehicle and the Mercury spacecraft was strengthened; the upper part of the Atlas was strengthened by the addition of an 8in-wide stainless-steel band to assist in distributing local stresses over greater areas; and bracing was changed on the elbow-shaped oxygen vent valve which fits into the top of the Atlas liquid oxygen tank.

These modifications were an interim action in order to permit an early launch date prior to the heavier-gauge Atlas becoming available. Delivery to NASA of the thick-skinned version of Atlas, which has already been used by the USAF in Samos and Midas launches, will begin soon. The loads imposed on the Atlas structure during Mercury flights, NASA have indicated, are substantially higher than normally experienced by the missile.

The MA-2 Atlas vehicle was highly instrumented to gather more information about the booster phase of the flight. The additional instrumentation included strain gauges, thermocouples, break wires, accelerometers and an extensiometer to report physical conditions through the upper-tank adapter area. An extra telemetry transmission canister was added in one of the side pods of the Atlas to transmit 20 channels of information to the ground.

The spacecraft itself did not contain all the systems which will be included in later flights. Among those omitted were the landing impact bag, environmental control system, astronaut couch, control panel and retro-rockets. Bolted to the floor at various points inside the spacecraft was more than 200lb of sensing instruments, cameras, recorders and a telemetry system. This system provided eight channels of information drawn from approximately 200 sources, and was designed to cease transmission when the main antenna canister was jettisoned at approximately 10,000ft.

Two tape recorders on board recorded the same data as that which was telemetered. Temperature data were measured at some 90 points inside and on the surface of the spacecraft, mainly in the conical section. Also measured were pitch, yaw, and roll rates, acceleration, attitudes, pressures, vibration and external noise levels. Other data channels were used to inform ground monitors of such flight functions as escape tower separation, adapter clamp release, capsule separation and drogue parachute deployment.

SICK TRANSIT

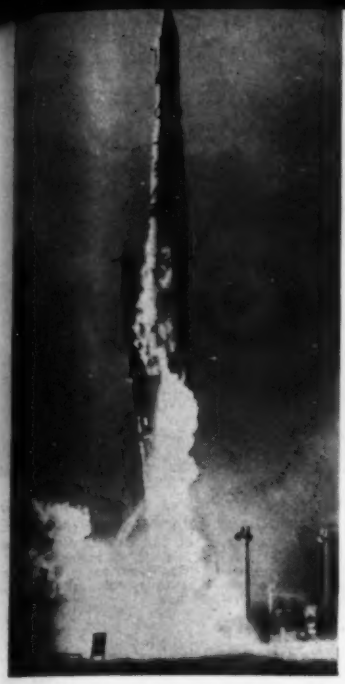
On the same day as the successful Mercury-Atlas MA-2 launch, February 21, Cape Canaveral was the scene of another attempted satellite launching, this time not so successful. It was intended to place in separate orbits two satellites by means of a single firing of a Thor-AbleStar launching vehicle, but the two payloads failed to separate from each other and from the final stage of the rocket.

The main satellite was the US Navy's Transit 3B, a 250lb experimental navigation satellite, and the "piggyback" unit was a 54lb sphere nicknamed Lofti, designed to study low-frequency radio transmission through the ionosphere. A similar double launch was successfully accomplished in June, 1960, when Transit 2A and the NRL radiation satellite Greb were placed in orbit by a Thor-AbleStar. In the February 21 launch the Transit satellite carried a magnetic memory unit enabling it to transmit its position in space, an electronic clock to provide a time standard, and an electronic system designed to map the Caribbean accurately.

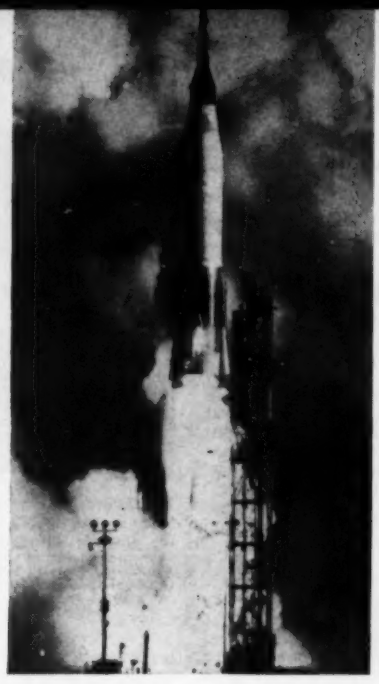
It was at first reported that the two satellites had achieved successful orbit at almost 575 miles altitude, but later it was divulged that the two had failed to separate and in fact were still attached to the second stage of the launch vehicle. This combination was in an elliptical orbit of 104-617 miles instead of the separate, near-circular orbits planned at about 500 miles.

FALCONS FOR SWEDEN

After lengthy negotiations, the Royal Swedish Air Board have brought to a successful conclusion their plans to adopt the Falcon air-to-air missile as primary armament for "a new version" of the Draken intercepter (doubtless the J 35B). Announcement is expected shortly of an agreement with the US Air Force and



Vandenberg Air Force Base, February 18: Launch of USAF Discoverer 21 satellite into polar orbit by Thor-Agena B. Agena B restart demonstrated, no data capsule carried



Cape Canaveral, February 21: Launch of Atlas booster carrying NASA Mercury MA-2 capsule on 1,425-mile flight down the Atlantic range (see news item "Mercury MA-2 Success")

Cape Canaveral, February 21: Launch of US Navy Transit 3B and "Lofti" satellites by Thor-AbleStar (see news item "Sick Transit"). The two planned orbits were not achieved

Hughes Aircraft permitting licence-production of the missile in Sweden. This agreement is expected to cover the production of both radar-guided and infra-red versions of the Falcon, probably the GAR-3A and GAR-4A, both of which will be carried in each Draken.

From the inception of the J 35B, its fire-control system has been developed to permit the introduction of a missile of this nature. The Saab S7 collision-course fire-control system is employed, which is linked with the Stril-60 semi-automatic defence electronic network (a major contractor for which is Marconi). The Swedish Air Force is already fully armed with the American Sidewinder air-to-air missile, which as the Robot 324 is used on the J 35A Draken, J 32B Lansen and J 34 Hunter.

THE COMING OF PROTEUS

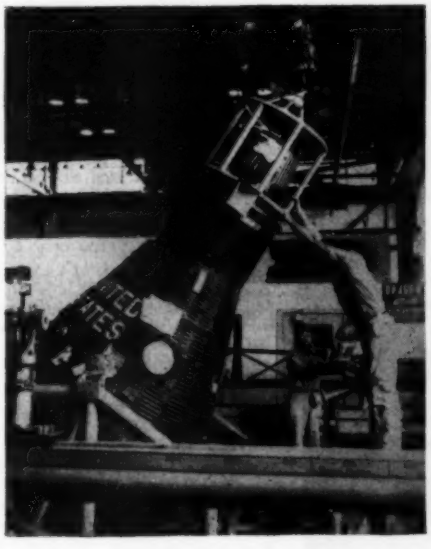
Although on February 20 unofficial reports from Washington suggested that the US Navy was having second thoughts about establishing a permanent FBM submarine base in Scotland, the depot ship USS *Proteus* finally sailed from New London, Conn, on February 21 and is due to arrive in Holy Loch at about the time this issue appears.

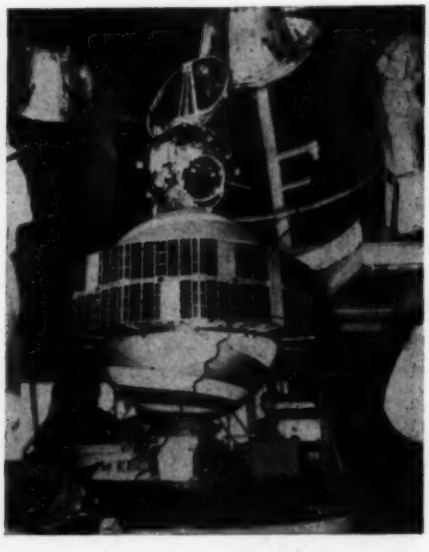
The ship was built by Moore Shipbuilding and Dry Dock Co of Oakland, Cal, during 1942, and she had a distinguished career at the end of World War 2. On January 15, 1959, she arrived at the Navy Yard at Charleston, SC, for conversion as the first depot ship for FBM submarines. An indication of the scale of this conversion is provided by the fact that a 500-ton section was spliced in amidships, 44ft long and six decks high. Acceptance trials were held in July last year and she is now fully operational under the command of Capt Richard B. Laning. She has a displacement of 18,500 tons, and her immediate task will be to support the operations of the first three Polaris submarines, *George Washington, Patrick Henry* and *Robert E. Lee.*

ZEUS FLIES WITH GUIDANCE

The first research-and-development launching of a Nike Zeus high-performance surface-to-air missile of the current configuration (*Flight*, January 29, 1961) and equipped with a guidance system took place at White Sands shortly before February 10, on which date the US Army announced the fact. It is most unlikely that the trajectory was controlled by an airborne guidance equipment operating in conjunction with ground radars, although Goodyear Aircraft Corp have been permitted to release a photograph of the R and D Zeus acquisition radar recently installed at White Sands. Goodyear produce the transmitting and receiver aerials, together with the spherical 110ft-diameter radome.

So much for launchers, now for payloads. Right, NASA's Mercury MA-2 spacecraft being readied for the February 21 ballistic flight, reported on the opposite page, in which it was subjected to speeds up to 13,000 m.p.h., airloads of 900lb/sq ft, and temperatures of 3,000°F on the ablative heat shield and 2,000°F on the afterbody





"Partially successful" on the same date was the attempted double launch of the US Navy's Transit 3B navigation satellite and the smaller "Lofti" by means of a Thor-AbleStar vehicle. The photograph (far right) shows the two satellites prior to the launch. Orbit was achieved, but separation from the final stage was not effected

Missiles and Spaceflight . . .

ANGLO-FRENCH INDUSTRY STUDIES JOINT SPACE PLAN

THE second expression of interest in space activities by British industry in recent weeks, and the first to involve companies abroad, was the announcement on February 28 of joint studies which have been carried out by the Hawker Siddeley Group and the French company SEREB (Société pour l'Etude et la Réalisation d'Engins Ballistiques). Three projects have been put forward for government consideration; (1) civil communications satellites, (2) civil navigation satellites, and (3) military anti-satellite missiles. It was stated by Sir Roy Dobson that the studies had already been submitted to the British and French Governments. The designs, he said, were not allied to any particular rocket combination.

The results of the joint studies are contained in a 225-page brochure entitled *Industry and Space. A Franco-British Study of European Potential.* Considered in turn in this report are the origin of and recent developments in astronautics; economic and financial aspects; technical aspects; advanced studies for a space programme; and technical and industrial co-operation on space matters. Main points from a number of these sections are given on this page; it is hoped to describe the technical aspects of the individual satellite designs in future issues.

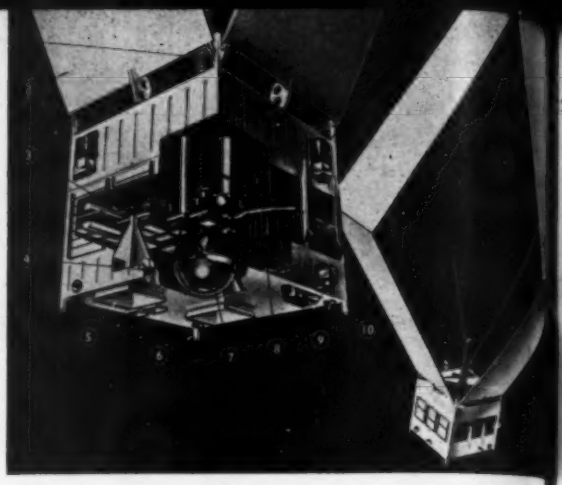
After considering the respective defence expenditures (in relation to gross national product) of the United States, Britain, France and the other European countries; and European gross national products as proportions of that of the USA, the authors of the report suggest that an Anglo-French programme could amount to $400-500m over a four-year period, and an OEEC programme could reach $800-1,100m.

For an $800m programme, it is suggested, the total could be divided into $300m for research, equipment, data acquisition and handling; $300m for technological developments including vehicles; and $200m for specific space applications. Assigning individual national costs on the basis of national income, the annual costs for Britain and France would be: (1) On the basis of an Anglo-French four-year programme of $400m: Britain 59m, France 41m.

(2) On the basis of co-operation between Britain, France, Germany, Italy and Benelux in a four-year, $800m programme: Britain 60m, France 44m.

(3) On the basis of co-operation between all European countries in a four-year, $800m programme: Britain 50m, France 36m.

Two separate proposals for an active communications satellite are presented in the report, one British and the other French. The British one is based on a station-keeping, attitude-stabilized satellite whose transmitter incorporates a travelling wave tube operating on a frequency of approximately 2,000Mc/s—implying high power requirements but a less-severe problem of frequency allocation. The French proposal is designed around a transmitter using a triode valve or transistors and operating around 500Mc/s. This satellite would have no mechanical stabilization, but could incorporate "electronic stabilization" by antenna selection. This would be a smaller, lighter satellite, but might be required in greater numbers.



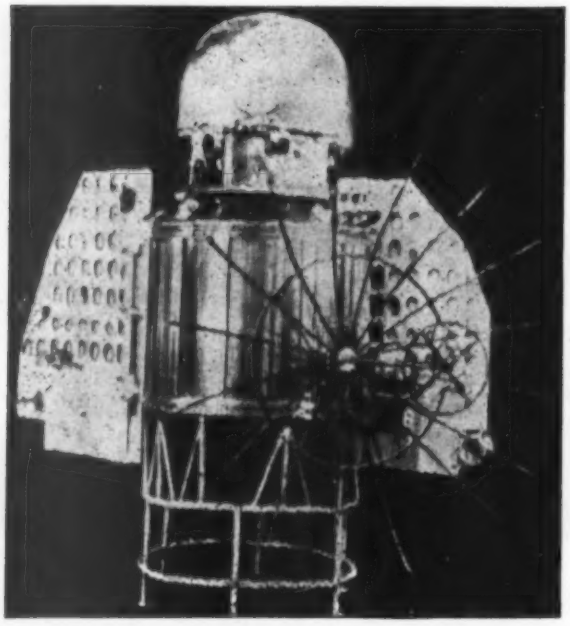
The larger of two communications satellites described by Hawker Siddeley and SEREB as suitable for a European space programme, the proposal illustrated here is the work of the former organization
1 solar-cell erecting mechanism, 2 solar-cell panels, 3 radio equipment, 4 infra-red sensors, 5 aerials, 6 final-stage attachment points, 7 attitude stabilization propellant tank, 8 batteries, 9 attitude stabilization nozzles, 10 thermal control shutters

In addition to the communications and navigation satellites and the anti-satellite missile described in the report, it is suggested that the launching of a large number of small (100-200lb) scientific satellites would be most useful, particularly in gaining experience and obtaining reliability.

It is considered in the report that a European programme would essentially involve three main phases. First, a formulation by government authorities of joint specifications. Secondly, the preparation of design studies by industry. Thirdly, research, development and production of a space system. Work would be apportioned on the basis of participating countries' financial contributions, with particular countries participating only in the particular projects in which they were interested.

The French SEREB company was set up by the French Government in 1959 to act as systems managers for the development of ballistic weapons. Shares in the company are held by Nord-Aviation, Sud-Aviation, SNECMA, Office National d'Etudes et de Recherches Aéronautiques, Générale Aéronautique Marcel Dassault, MATRA and SEPR.

VENUS PROBE: FIRST PICTURE



IMPROVED accuracy and a more-precise date of arrival for the Soviet space probe now heading towards Venus were announced by the Tass news agency on February 26. The distance of the probe's nearest approach to the planet was estimated at "less than 100,000km" (62,000 miles), and it was stated that this position would be reached on May 19 or 20.

On the same day, 14 days after the launch of the probe, the first pictures of it were released for publication. The shape of the spacecraft is cylindrical, and the size (excluding antennæ and solar-cell panels) is 2.03 metres (6ft 8in) in length and 1.05 metres (3ft 6in) diameter. The news agency described the special control and tracking centre as an "automatic measuring radio technical complex" which had been created "to guide the automatic space ship, define its orbit and keep up two-way communication over hundreds of millions of kilometres."

According to an article in *Pravda* on February 26, data concerning the orbit of the satellite from which the probe was launched was obtained by a number of ground stations and also by ships at sea. The probe was said to carry four antennæ; one for short-range communication, two for medium-range work, and a parabolic framework designed to provide communications for the final approach to Venus.

Spectacular achievements, delayed announcement of details, and poor-quality photographs have come to be regarded as the Soviet tradition in space affairs. The third of these characteristics is illustrated here in the first picture of the Venus probe, stand-mounted prior to launch

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The men who fly these machines have a training second to none in the world, starting with a six months' course at the Britannia Royal Navy College, Dartmouth. The basic qualities required of to-day's officers of the Fleet Air Arm are the same as in Nelson's day—initiative, intelligence, resourcefulness and determination.

The responsibility is great and the rewards are equal to it—adventure, enjoyment, travel—and after 12 years a tax-free gratuity of £4,000 or £1,500 after 8 years.

Of course only a select number can qualify as pilots and observers. But why shouldn't *you* be among them? You must have a zest for flying, be attracted to the Naval way of life and be able to pass the Interview Board which is designed to test your fitness, intelligence and character.

The age limits for entry are 17–25. You must have passed the G.C.E. at "O" level in English Language, Mathematics and two other approved subjects (*three* other approved subjects after 1st September 1961).

When qualified, pay at age 20 is £949 a year; a married officer of 25 can receive up to £1,760 a year. Selected officers serving on a 12 year engagement have the opportunity of transferring to a pensionable career.

New 5-year commissions for Helicopter Pilots

There is a new scheme of engagement for men wishing to specialise as helicopter pilots only. They join between ages 17 - 26 on a 5 year commission and receive £775 tax-free gratuity on termination.

Send for the new illustrated booklet "Fly with the Fleet Air Arm" which will give you full details.

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FAA 16

Missiles and Spaceflight . . .

JUPITERS IN TURKEY

On February 8 the Turkish foreign ministry announced that five days previously the Soviet Government had delivered a note enquiring into Turkish plans for IRBM deployment. As a member of NATO, Turkey was naturally approached by the US Government some three to four years ago, when it became time for the deployment of the American IRBMs Jupiter and Thor to be considered. It has long been common knowledge that the deposed Menderes Government agreed in December 1957 for Jupiters to be supplied to the Turkish Army, and plans to put this into effect have been in hand for more than two years. But it is significant that, when questioned on the topic last year, the new Premier, Gen Gursel, gave a somewhat evasive reply.

Jupiter is a mobile weapon, originally developed by and for the US Army, but turned over to the US Air Force by the Wilson Memorandum of November 1957. Although Strategic Air Command squadrons have been named as being equipped with the missile, none appears to have reached field deployment, and the only effective Jupiter units appear to be a squadron of the Italian Air Force and the expected battalion (or more) of the Turkish Army. Both forces are, of course, fully committed to NATO, and could not be used unilaterally by their own governments.

SOVIET ROCKETS STUDY ECLIPSE

A number of geophysical rockets were launched simultaneously in the zone of the total solar eclipse in Russia on February 15. After the separation of an "automatic station" from each, according to the news agency Tass, an electro-mechanical system was switched on to stabilize the attitude of the stations.

Photographs, radiation intensity measurements and spectrographic measurements of the solar corona were taken. Results were telemetered to Earth, and the photographs and spectrograms were recovered by parachute.

In addition, meteorological rockets were launched before, during and after the eclipse with the object of investigating the state of the stratosphere and determining the effect of solar radiation on changes of air temperature in the atmosphere.

Goodyear Tire & Rubber Co's Research Division is engaged in the development of solid-propellant rocket case liners moulded in heat-insulating synthetic rubber.

No attempt was made to recover the 300lb data capsule of the USAF Discoverer 20 satellite launched on February 17. Originally scheduled for February 21, the recovery attempt was cancelled because of a defect in the equipment.

Mr Kennedy's US Navy Secretary, Mr Connally, has announced completion of contracts for the five additional Polaris submarines required to bring the total number authorized up to 19. Three have joined the fleet, four more launched and four more are under construction.

A white rat named Hector was recovered in apparently good health after a flight to a height of 150km (93 miles) in a Véronique rocket launched from the French rocket base at Hamaguir in the Sahara on February 22. Physiological data were telemetered to the ground during the flight.

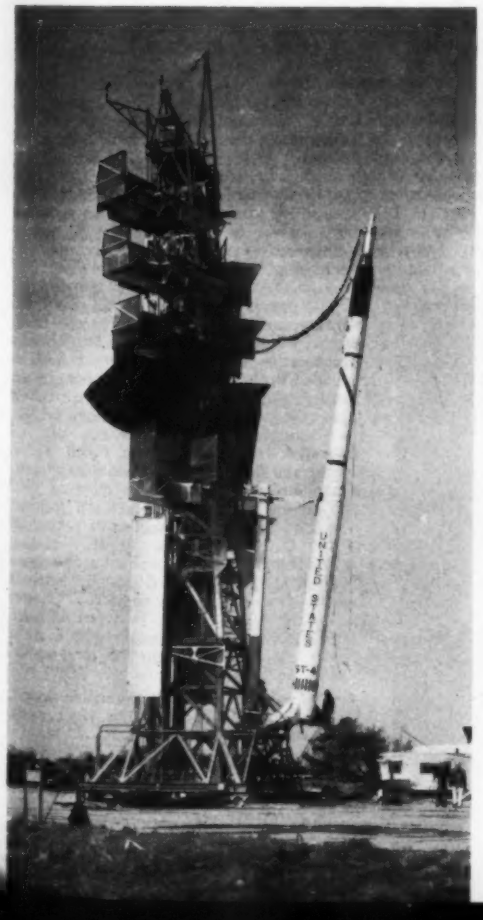
Boeing announced last month that Central Aircraft Manufacturing Co, of Downsview, has signed a contract to assist in the installation of Bomarc missiles at RCAF North Bay, Ontario. The company is jointly owned by D.H. Canada, Canadian Aviation Electronics and Ferranti-Packard Electric.

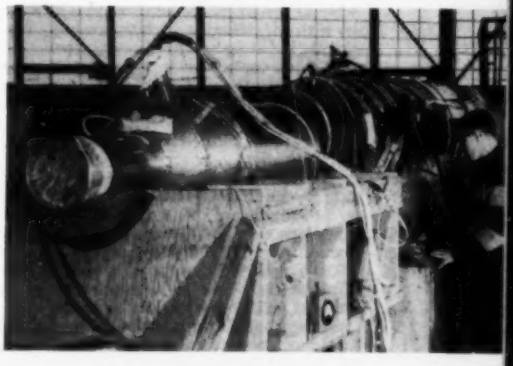
According to an American admiral, sunken acoustic buoys have been found off both the east and west coasts of the United States. These markers are reportedly nuclear-powered, apparently with isotopes capable of producing power for some 50 years or more. They are believed to have been placed in position by Soviet submarines and fishing vessels in order to assist in positioning missile-launching submarines.

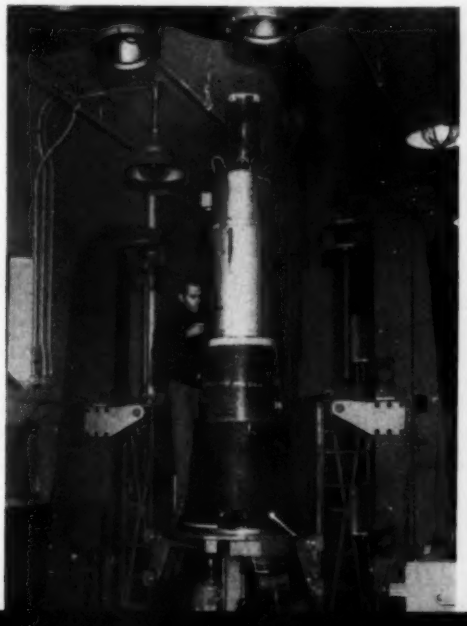
Selection of the Project Mercury astronaut to make the first manned ballistic flight down the Atlantic Missile Range from Cape Canaveral will be made from a short-list of three of the seven men. They are Lt-Col John Glenn of the Marines, Capt Virgil Grissom of the Air Force, and Cdr Alan Shepard of the Navy. This was announced by the Project Mercury director, Mr Robert Gilruth, on February 21.

United Technology Corp announced last month that the third and last NASA feasibility firing of conical segmented solid-propellant rocket motors was completely successful. The motor differed from the first two in having bolted flange joints, and it was rated at 15,000lb for 50sec. UTC state that it will test much larger engines of similar design in the very near future. A photograph of the first of these motors appeared on page 5 of our January 6 issue.

First Satellite Launch by All-Solid Scout







Launch preparations at Wallops Island, Virginia, for the Explorer 9 firing of February 16 are depicted in these photographs. This occasion was the first in which the National Aeronautics and Space Administration's four-stage, all-solid Scout was used to place a satellite in orbit. Left, Scout No 4 and payload undergo final checks on the launch pad; right, hangar testing of the complete vehicle (note folded balloon inside cylindrical container); below right, payload and final stage on spin balance table. The launch was reported and the inflated satellite illustrated in last week's issue

THE visit this week of the Queen and the Duke of Edinburgh to Nepal focussed attention on a mountain kingdom which has been opened-up by air transport only in the past ten years. This article examines the place of the Dakota in Nepal's transport system—although external pressures are forcing the purchase of more up-to-date aircraft. John Seekings wrote the story, his wife June took the pictures.

YAK to DAK

Nepal's Airline and its Unique Operations

IN a world which has come to regard intercontinental jet travel with bored indifference it is rather nice to be able to say, "I remember that in Katmandu they were known as the Him*maal*-yars." That Nepal still lies well off the beaten track is hardly surprising, for until recently the country was openly hostile to all but mountaineers and yeti-seekers. The first official tourist brochure was compiled and issued only a few months ago. And until last year there was only one modest "Western" hotel in the whole country; now there are two in Katmandu, soon to be joined by a third, though as yet the only tourist accommodation outside the capital is to be found under canvas.

To find the reason for this reticence in cashing-in on what must be the world's most remarkable landscape, coupled as it is with one of the world's best year-round climates, one must look back at Nepal's past. In brief, the country has since the mid-eighteenth century been united under the royal rule of the Shah dynasty. However, for just over one hundred years, from 1847 to 1950, the reins of power were firmly held by the Ranas. This aristocratic family, whose members filled all the important positions of State, were fully aware of the corruptive influence of foreign ideas, and therefore insulated their subjects by the simple expedient of banning travel. Only with the democratization of the country in 1950-51 did it become conceivable to operate air services to the outside world. This explains why Nepal's first airport was built as recently as ten years ago.

As soon as Katmandu's airfield was ready for use one of Indian Airlines' predecessors, Indian National Airways, opened a twice-weekly Calcutta - Patna - Katmandu service with DC-3s. In the summer of 1951 this frequency was increased to six per week, at which level it has continued to the present day, first by INA and more recently by IAC. But it was not until the present Monarch, King Mahendra, came to the throne in 1956 that an effort was made to form a national airline. A contemporary travel book on Nepal hints at the main reason for this move: "the noise of the splendid coronation was scarcely over when the King hammered out a daring project; he would visit his country." The significance of this is that surface travel in Nepal is near impossible, even for a popular monarch; it invariably involves a journey down the valley to the nearest Indian railhead, then a train, and finally a long trek up valley to one's destination. Typical of this is the journey from Katmandu to the nearby provincial capital, Pokhara; by surface this takes eight to ten days, by air a mere 45 minutes.

In anticipation of the King's first tour of his country, a number of airfields were prepared, and these were to provide the basis of a network of internal services. Initially operated by Indian Airlines Corporation under contract, they covered three routes radiating from Katmandu: eastward to Biratnagar, southward to Simra, and westward to Pokhara and Bhairawa. Meanwhile, men and machines were being assembled locally, and the Royal Nepal Airline Corporation was formally constituted with mixed government and private backing. Operations began in July 1958, with RNAC taking over IAC's internal services, leaving the Indian national carrier to continue the six-times-weekly Patna - Katmandu service. This pattern of services persisted until the spring of 1960, when RNAC, by then wholly State-owned, embarked on a three-point expansion programme.

In the first place, each of the existing domestic services was improved: on the short route to Simra, frequency was increased from six to seven; the Pokhara/Bhairawa service was improved by the inclusion of Gurkha (which town, because of its military traditions, has given its name to Nepali soldiery generally); while the Biratnagar connections were strengthened by the addition of optional traffic stops *en route* at Janakpur or Rajbiraj, and an optional extension to Calcutta. Secondly, a new once-weekly service was inaugurated to the extreme western corner of Nepal, following the route Katmandu, Bharatpur, Bhairawah, Dang, Nepalgunj and Dhangarhi. Unfortunately, because of the condition of the runways at these points, this service cannot be operated on a year-round basis.

Finally RNAC opened its own external services from Katmandu to Patna (three per week), to Calcutta and to Delhi (each two per week). IAC continued to operate their old six-times weekly Patna - Katmandu service and also joined RNAC on Katmandu - Delhi and Katmandu - Calcutta, their frequency in each case being three per week. This brought IAC to the upper limit of twelve flights weekly, to which the designated Indian carrier is restricted in the Indo-Nepal bilateral agreement. That RNAC's frequencies lag behind those of IAC is hardly surprising, for not only is the Indian Airline longer-established but it also enjoys better interline facilities.

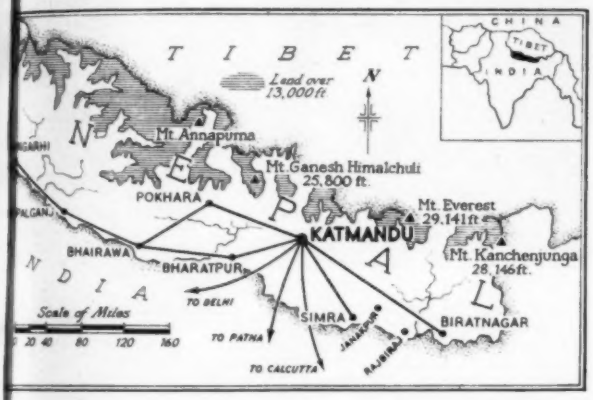
Although RNAC's services are all operated by three DC-3s, until a few weeks ago the fleet numbered four aircraft. Unfortunately, towards the close of 1960 the airline suffered its first fatal accident when an aircraft crashed while taking off on a charter freight flight. Existing schedules represent an annual requirement of 3,300 hours, divided equally between external and internal services. Charter operations—principally between Pokhara and Bhairawa in connection with Gurkha troop movements—bring the total annual

One of RNAC's DC-3s at Katmandu Airport. Two other spellings for the city's name, incidentally, are Kathmandu and Khatmandu

This street in Patan, near Katmandu, is typical of urban scenery in Nepal

Points on RNAC's Network

Bhairawa	*Important railhead*
Bharatpur	*Centre for an extensive project*
Biratnagar	*Another railhead in extreme east. Important hydro-electric project*
Calcutta	*Commercial and tourist centre*
Delhi	*Diplomatic and administrative centre of Indian Government*
Dhangarhi	*Entry point into far western districts*
Janakpur	*Important place of pilgrimage, legendary birthplace of Sita, wife of Rama*
Katmandu	*Capital and population centre of Nepal*
Nepalganj	*Another railhead and place of entry into far western districts*
Patna	*Connecting point for IAC services*
Pokhara	*Scenic valley of lakes and snow-clad mountains*
Rajbiraj	*Important district in the plains; Kosi Dam project*
Simra	*Main entry point to Katmandu Valley and adjoining districts*



requirement to almost 4,000 hours. This cannot be provided by three aircraft as the company has usually to allow for one aircraft being out of commission down at Barrackpore (near Calcutta), where Hindustan Aircraft Ltd undertake major checks. HAL also overhaul all RNAC's P & W R.1830s. For this reason purchase of a replacement aircraft is currently being considered to restore the fleet to full strength.

Operating at high average altitudes, RNAC's aircraft are restricted to 26,200lb on passenger services and 26,900lb as freighters. This means a maximum seating configuration of 28 passengers. Such a restriction is however, but one of three fundamental economic difficulties facing RNAC. Another acute problem is the cost of petrol; the average price paid to the suppliers works out at almost five shillings a gallon; and, after government duty is taken into account, the cost of a gallon rises on average to as much as seven shillings. This again is an unavoidable penalty of operating in a remote place like Nepal. The final burden borne by this airline is its cripplingly short-haul character; the average flight time over the whole network works out at slightly under the hour (external 2hr 15min, internal 45min). The most frequent service, Katmandu - Simra, involves a distance of only 44 miles!

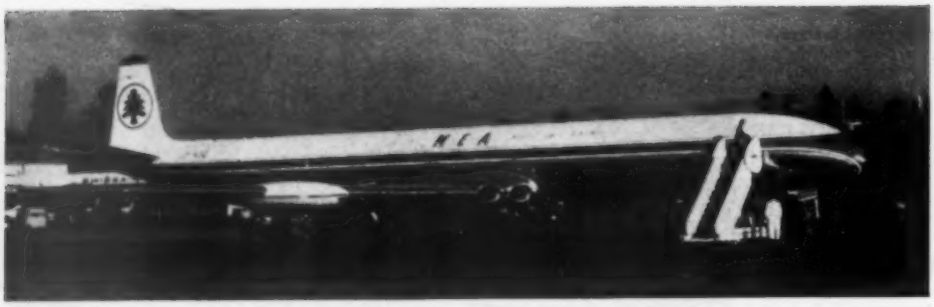
These adversities are reflected in an unusually high operating cost, equivalent to £75/hr. Despite this, the airline manages to break-even without recourse to subsidy. This is because load factors are pitched at a fairly high level—over 70 per cent—and fares are also above average between 6d and 10d per mile. This policy might appear at first sight to be typical of a monopoly whose main object is to avoid losses rather than to provide the best service to its customers. However, a 75 per cent load-factor in Nepal is not the same as a 75 per cent load-factor in Europe; where one is dealing with highly seasonal European traffic which tends to move in groups rather than individually, then this sort of load factor means that many would-be travellers are being turned away at the peak; in Nepal, traffic peaks and troughs are almost unknown, and almost every passenger is travelling alone. Another point is that pence per mile is not necessarily the best index of fare level—in Nepal it usually happens to be cheaper to fly quickly by RNAC than to travel laboriously overland by bus, rail or bullock-cart.

Although the DC-3 is an admirable aircraft for RNAC's present needs, future requirements are likely to involve the purchase of more modern equipment. To cater for whims of travel agents—who tend nowadays to dissuade tourists from flying on services using piston aircraft—it is becoming increasingly necessary to offer jet travel in some form or other on RNAC's external services (on which six out of every ten passengers are tourists, as often as not elderly American widows or spinsters). A likely way of meeting this need will be to acquire a couple of Fokker F-27s. Looking further ahead, the airline sees the day when it will be operating regional services with the very latest equipment; but it recognizes that a lot of water will have to flow under the bridges of the Bagmati River before enough hotel building, airport improvement and tourist promotion has been done to justify such an adventure.

JOHN SEEKINGS

RNAC Management: Chief executive, B. Rayamajhi; secretary, D. B. Rana; chief accountant, B. K. Das; operations manager, R. K. Simha; traffic manager, G. P. Bhattacharya; engineering manager, R. L. Green; purchasing manager, J. N. Singh.

King Mohendra's personal Il-14 — a gift from Mr Kruschev



MEA's second Comet, the subject of a delivery picture on page 254 last week, is now in scheduled service. It is pictured here at Cointrin Airport, Geneva

(Below) Plenty of space for expansion is available for MEA's overhaul base, the two hangars of which are now busy with work for a number of airlines

"FLIGHT" photograph

MEA—LATEST COMET OPERATOR

JET competition and additional expenditure resulting from the introduction of Comets notwithstanding, Middle East Airlines may show a small profit in 1960. The airline's finances thus present a much happier face than they did two years ago, when the Lebanese revolution ended. Plans for future expansion are based on opening-up new routes with Comet 4Cs, on continued high fleet-utilization, and on a sustained effort to reduce engineering costs.

Two factors should influence MEA engineering efficiency this year. First is the reorganization that has followed the disbandment of MASCO—the engineering organization funded by BOAC and intended to become an overhaul base for many airlines in the Middle East area. It was also hoped that the organization could act in a hiring capacity, leasing aircraft to operators during the period required for check 4s. MASCO never made money, partly because it never got properly under way, but also because, it seems, the wish of other operators to have their aircraft overhauled in the Lebanon was over-estimated. There was thus no call for reserve aircraft, and Dart overhaul—another activity which was contemplated—was made uneconomic with the rapid rise of time-between-overhauls of this engine. The hangars and equipment were bought by MEA at cost price.

MASCO is, however, still a property holding company and owns the land on which the two new hangars, now taken over by MEA, are situated. The airline's engineering organization was stiffened after the exchange (Mr W. K. Forsyth, BOAC's manager, line maintenance, is now engineering controller) and it is now responsible not only for the day-to-day maintenance and overhaul of MEA Comets and Viscounts, but performs on a limited scale tasks which would have been taken on by MASCO—overhauls for Kuwait Airways, Gulf Aviation and the Lebanese Air Force. Together the organization handles some eight major airlines and its comprehensive maintenance facilities are available to casual visitors—the PZL Kos was seen in one of the hangars during a recent visit.

The other factor influencing MEA's future efficiency is the scheme recently introduced by Sheikh Najib Alamuddin whereby employees are made shareholders in the airline. About 20 per cent of MEA's shares are allotted to its 1,975 employees and are bought by them over a period of six years up to a value equivalent to six months' salary. The management guarantees an annual dividend of 5 per cent and guarantees also to return the purchase price at any time during the five years following purchase. About 10 per cent of this block of shares has so far been taken up, but it was explained that a service qualification is necessary before an employee becomes eligible to apply for shares. MEA is also the first company in the Middle East to introduce a full medical insurance scheme and free dentistry for employees and their families.

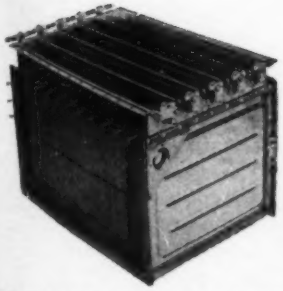
Although 1961 is to be a year of consolidation for the airline, expansion is anticipated on three fronts: on routes to Africa, leading possibly to services to South America; on services to Prague, Istanbul and beyond, and on the expansion of tourism in the Lebanon. Two weeks ago a Czechoslovakian delegation visited the Lebanon to discuss an exchange of traffic rights. The Czechs are asking for services from Prague to Beirut via Sophia, Tirana or Belgrade and through to Kabul, leaving eventually to Bombay, Rangoon and Djakarta and other points beyond India. In return for traffic rights through Beirut, the Lebanese are asking for services through Prague to Frankfurt, Zurich and London, through Ankara and Istanbul, and on through Paris, Hamburg and Amsterdam. "We are waiting to go behind the Iron Curtain," said the Sheikh, "and we note that airlines such as East German Lufthansa want rights in the Middle East and beyond."

MEA are making great efforts to attract tourists to the Lebanon, and the lower off-season fares which were introduced last month should bring their own reward. Both President and Prime Minister of the Lebanon, Gen Fouad Chehab and Saeb Bey Salam, say that they are aware of deficiencies in the transport system, tourist hotels and beaches, but they hope that, under private enterprise, these will shortly be rectified. There are some special attractions: it is possible in the Lebanon to go ski-ing among the cedars barely an hour and a half after swimming in the warm Mediterranean. If the tourist trade can be developed sufficiently, seashore and mountain slope might eventually be linked by scheduled helicopter services—the first in the Middle East.

A. T. P.

Now less than five hours from London, the Lebanon has much to offer the tourist. On the left is the city of Beirut and, right, part of the temple of Baalbek on the site of one of the world's oldest cities

VANGUARD by Vickers



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FLIGHT SYSTEM SURVEY

British Civil/Military Traffic Control

THE *Memorandum on the Air Estimates* (reviewed in *Flight* last week) indicates that the radar advisory service for flights above 25,000ft over the UK provided last year by RAF radars and joint civil/military control teams has become permanent. The radars at Bishops Court in Northern Ireland, Hack Green in the Midlands, London/Heathrow, and Sopley (near Bournemouth) are being used; their work was described in these columns on August 19 last year. Some 35,000 radar-controlled crossings of civil airways were made by military aircraft in 1960 and the radar coverage is to be extended to include the greater part of UK airspace.

A further stage will be the development of more powerful radar with computers and data-handling systems designed to intercept supersonic attackers, and this will form part of an integrated civil/military ATC organization. Tenders for an experimental civil semi-automatic traffic control system for Southern England were submitted early last year.

Mandatory DMET

THE Federal Aviation Agency has arranged a conference in Washington on March 22 to explain and discuss DMET with all parties concerned. Papers will be read on the development and use of DMET and on its manufacture and installation, and there will be an open discussion of *The Feasibility of Requiring DME on Civil Aircraft*. On Federal airways there are now 725 VORs, 344 of which also have DME; and there should be 883 Vortacs by 1966. There are 236 military Tacans as well. The FAA wants all high-speed aircraft in high-density areas to be equipped with DMET —very few are at the moment—and intends eventually to require DMET for all IFR operations.

Narco's New Radios

DETAILS of three important new light-aircraft radios have been released by Narco in America. They are the UDI-2 DMET, weighing 14lb, and costing £805 ex-works; the Mk 7, 360-channel transmitter/receiver covering the 118.0 to 135.95Mc/s band at 50kc/s spacing; and the Mk 10, which combines a Mk 7 with a 190-channel receiver covering the ILS/VOR bands and communications at 100kc/s steps up to 126.9Mc/s. The DMET receiver started as a private venture, but was later supported by an FAA contract for a special, low-cost business aircraft DMET.

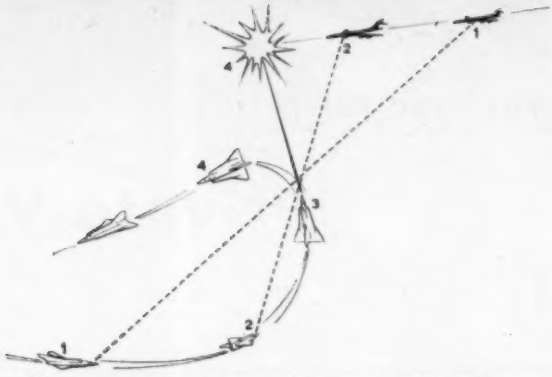
The UDI-2 covers 100 frequencies selected according to the standard pairing of VOR/DMET frequencies. The indicator on the 3in dial covers from 0 to 100 nautical miles on a logarithmic scale to give more precise indications at shorter ranges. Accuracy is stated to be 0.5 n.m. or 2.5 per cent. The equipment is also designed to provide outputs for eventual addition of a pictorial presentation or a groundspeed computer. Audio output is provided for station identification. The aerial is a broad blade protruding only 3in from the aircraft skin.

The UDI-2 will be marketed about the middle of this year. Certain airports in the USA are already offering simplified approach patterns and lower ceilings for DMET-equipped aircraft.

In accordance with Federal Aviation Agency intentions to change over to 50kc/s channed-spacing as soon as possible (clamorous complaints deterred the Agency from doing so last year) Narco have produced the 360-channel Mk 7 transmitter/receiver, which covers the band from 118.0Mc/s to 135.95Mc/s in 50kc/s steps. The panel-mounted portion, with its single frequency selector for single-channel simplex working, is designed to fit into a standard instrument cut-out so that it can replace or augment any existing installation. The separate power supply weighs 6lb. Although the FAA will continue until 1966 to provide traffic control service on 100kc/s-spaced channels below 126.9Mc/s, the more refined radio is already useful and will eventually become mandatory. The Mk 7 costs £427 ex-works.

Third of the new radios, the Mk 10 combines in a single case a Mk 7 50kc/s communications radio with a 190-channel receiver covering the VOR/ILS bands and communications at 100kc/s spacing up to 126.9Mc/s. A CS-3A converter and indicator adapt the 190-channel receiver for VOR/ILS and make what Narco term a "1½ system." The panel-mounted portion of the Mk 10 is 12in deep and has the same frontal area as the earlier Mk V and Mk VI. Together with its remote power supply, the Mk 10 weighs 12.5lb. Power output is stated to be 8W. The Mk 10 costs £605 ex-works.

Narco are now also offering the UGR-1 glide-slope receiver as a remote-mounted unit to FAA technical standard order specifications and with a tuning system compatible with the standard ILS localizer element. It weighs 6.75lb and costs £248 ex-works. American business pilots often use ILS localizer and marker beacon alone to make ILS approaches in fairly high minima, but Narco can now offer the UGR-1 to complete the equipment. Conversely, the UGR-1 glide-slope could be used for a precision approach in conjunction with ADF tuned to the locator beacon and a marker-beacon receiver.



Saab have released some details of the "snap-up" lead-collision course attack from below a target. The fire-control system computes the relative positions of intercepter and target when, at 1, the radar is locked-on and directing the pilot. At 2 the pilot is instructed to pull up, arm the missile and press the firing button. At 3, the fire-control has fed the necessary information to the missile and launches it automatically. At 4, the missile strikes and the intercepter pulls away

Toss-bombing for the Etendard IV

THE French Government has ordered Saab BT9F toss-bombing computers for installation in the Etendard IVs being produced for the French Navy. The order was placed after competitive evaluation and Saab state that negotiations for orders from other countries are proceeding.

The BT9F incorporates an electronic analogue computer which automatically measures height, dive angle and airspeed to compute the point at which, during a pull-out from the initial dive, the weapon should be released. An additional device makes the BT9 suitable for air-to-ground rocket-firing.

Similar computations in conjunction with a fire-control radar allow the type of air-to-air attack illustrated at the head of this page. If the target is well above or beyond the ceiling of the intercepter, the radar data are presented on the scope to guide the pilot into a snap-up manœuvre. At an appropriate signal the pilot arms the missiles and presses the firing button. After that the fire-control feeds the necessary parameters to the missile and launches it upwards. The intercepter pulls away over the top.

Left, above, the new Narco UDI-2 DMET for business aircraft. The tuner/indicator is panel-mounted and the power unit remote. Below are the new Mk 7 360-channel, 50kc/s spacing transmitter/receiver and the Mk 10 combined 360-channel transmitter/receiver and 190-channel VOR/ILS and communications receiver

SPORT AND BUSINESS

Private View BY P.P.O.

IT'S funny how small and seemingly unimportant happenings in one's daily life sometimes have a big impact. Often we do not realize it until a few hours or even days after, when suddenly we grasp its significance. Such an event occurred to me last week. I was travelling up to town in my suburban train one morning, when from over my paper drifted a few words; ". . . first-class finish, old boy. Engine revs as sweet as a sewing machine."—just the usual new car owner's stuff. I close my ears, and then suddenly I hear, ". . . difficult to make her stall with full flap." My ears flick up, the leader is forgotten! Can it be? Yes, after some more eavesdropping I discover it is! The first swallow of summer, the middle-aged businessman who has just learned to fly, who has just bought himself an aeroplane and who now intends to get full value for it, both on the ground and in the air.

Yes, here it is; "Le Touquet or Dinard for the weekend . . . No more crowded roads and passport queues . . . the missus is looking forward to the summer . . . the kids think nothing of it"—everything that we older pilots know could and should be possible. I just had not the heart to tell him of the hours of weary telephoning, the form-filling, the threatening letters from the Ministry, the waiting in bleak ghost-town aerodromes, the heavy fines for "criminal" offences, which he was certainly letting himself in for. I wondered if he would still own an aeroplane in a year or two's time.

It is nice to own an aeroplane, but would the memory of little ships on a sparkling foam-flecked sea far beneath compensate him for the reception he is likely to get if he decides for personal family reasons to drop in at some aerodrome unannounced? They are liable to look askance at you in the local golf club when they read in the paper that you have been fined £200 for an unauthorized landing on a disused aerodrome. Instead of being something of a hero to your friends, they will argue that you must have been up to something pretty shady to be fined all that amount. Invitations to local cocktail parties will tend to drop off and, when you try to tell them of a trip in an hour or two to some lovely old French town that would have taken a day by rail or car, they will change the subject politely and drift away.

Would the memory of landing on some friendly farmer's field, and walking through the dew to an hospitable welcome, compensate him for the worry of the inevitable complaint from the local bobby, followed by a visit from the Ministry's police, and visits to lawyers to defend a charge of low flying?

One can only hope that it would, and that one day he, with other citizens who want to use the air for their own pleasure and not to the harm of anyone, will be able to make his voice heard so that we may all come out of the present nightmare and the light aeroplane may come into its own in this country.

The Royal Aero Club competitions and races for 1961 have now been announced. The well-worked-out Business and Touring Aircraft competition is being held again, and it is good to know that the famous King's Cup race with its qualifying races at Cardiff are being held again—this time, however, with the addition of foreign aircraft to the entry list.

How many private owners of modern aircraft will want to risk their engines will remain to be seen, but no doubt some manufacturers and agents will consider that the advertising value and the spur of competition may compensate them for the risks involved.

Curiously enough, although we may be behind in the world light-aircraft field, these two competitions, if they are well-run, may become unique in world light flying. We may hope that foreign aircraft will come over here in their numbers—not because they are likely to meet anything over here which will worry them, but perhaps because for the same reason that lawn tennis players from all over the world come to play each other at Wimbledon. They know they will receive courteous and fair treatment, and that the competitions will be held in the happy semi-amateur spirit which is so important.

But what fun it could be if some kind folk would run a competition on a national scale to test out young pilots, irrespective of the age or price of their mounts. Easier said than done, says you. Something on the lines of those jolly circuit and landing competitions which they hold for the Fair Oaks Cup. Nobody minds very much who wins but, all the same, it is a test of airmanship. Join this with a navigational cross-country, a taxying competition,

"If some kind folk would run a competition on a national scale to test out young pilots . . ."

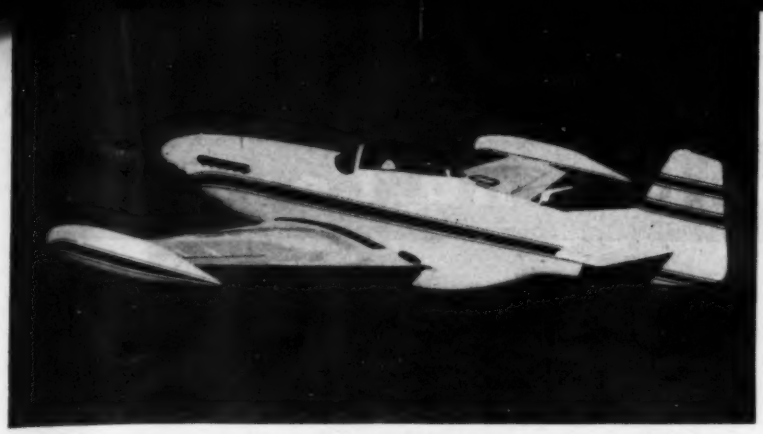
with marks to be given for good parking, picketing, and common-sense handling of your aeroplane, and we shall have a very amusing competition which will tend to bring about better standards in the air and on the ground, to the pleasure of our insurance companies and the reduction of repair bills.

I hope that nothing which I said in a recent article gave the impression that the cheery welcome which is so important these days to the private flyer is only obtainable in France. Although, on the whole, we can't match the cuisine, you are always sure of help and courtesy if you drop in at Fair Oaks, Elstree, Stapleford or Redhill, to mention only a few spots near London. Panshanger, presided over by our old friend Maurice Imray, goes out of its way to make you feel at home. Everyone is glad that the Cardiff Air Race is starting there this year. Whatever the weather, we shall be sure at least of a good beginning to the weekend.

UNVEILING of the Beagle Auster, first of the new aircraft to be produced since the formation of the Beagle company, will take place at Baginton Airport, Coventry, on the occasion of the Shackleton Aviation Weekend on April 28, 29 and 30. A public enclosure, display booths for the main manufacturers and agents, and an anticipated record number of aircraft on display are among other features of this year's meeting. Foreign aircraft to be shown in this country for the first time include the Klemm Kl 107c, Dornier Do 28, Lockheed LASA 60 and possibly the Beech Baron.

The aerodrome will be open from 11 a.m. to 6 p.m. on each of the three days. Admission to the public enclosure will cost 2s 6d (children 1s), with close inspection of the aircraft available only to those who pay an additional 10s for an airfield lapel badge. Perhaps as a result of previous years' experience, unaccompanied children will not be allowed in the aircraft park. Visitors arriving by air will be admitted free of charge. As well as the static display of new and used aircraft, and individual flights for potential customers, pleasure and demonstration flights will be organized each afternoon between 3 and 4 p.m.

NEW ACTIVITIES are being planned and a widening of membership is under way at the Belgravia headquarters of the Association of British Aero Clubs and Centres. Perhaps the most interesting development is the acquisition of the United Kingdom agency for the attractive Fairey Tipsy Nipper which, powered by a 45 h.p. Stark Stamo 1400A engine, is available either complete or in kit form. Price of the standard aircraft is £1,275 complete and £1,115 in kit form (for delivery at Gosselies and at London docks respectively). Additional costs include £1 10s for certificate of registration; £5 for ARB validation of Belgian C of A; and £9 if airspeed indicator and altimeter with British-type presentation



Latest version of Trans-Florida Aviation's executive Mustang is the Cavalier 2000, described in a news item on this page. Range is 2,000 miles, service ceiling 40,000ft, and maximum cruise 424 m.p.h. As shown in the photograph on the right, baggage space is provided in the wings

(i.e. not metric) are desired. In the case of Nippers built from kits by amateur constructors, the Association is authorized to inspect and recommend to the Ministry of Aviation the issue of a Permit to Fly. One Nipper is at present being assembled for the Association by Derby Aviation at Burnaston.

Membership of the ABAC is at present divided into five grades: (1) Membership, for approved flying clubs and air centres with over 50 members; (2) associate membership, for clubs, centres and groups with less than 50 members; (3) affiliate membership, for clubs (such as many of the company flying clubs) which use the facilities of member clubs; (4) overseas membership; and (5) auxiliary membership, recently established for bodies other than clubs, centres and groups "whose activities are connected with and of benefit to the flying club movement." The first auxiliary member was Denham Link Training Centre.

A sixth grade is now being added to cater for individuals who wish to take advantage of the facilities offered by the Association. For an annual independent-membership subscription of two guineas, these facilities will include honorary membership of a London club, insurance covering injury in aircraft accidents, a briefing and advisory service for continental and other flights, discounts on the navigational and other equipment sold by the Association, and specially arranged flying meetings and other functions. The chairman of the ABAC, Mr G. H. M. Miles, expects that this new grade of membership will appeal both to private owners and to club members. Looking ahead even further, Mr Miles is convinced that his Association has much to offer to business operators, also, particularly in services such as approved servicing schemes. Other facilities now being used by the clubs and groups, he points out, could easily and usefully be extended to business operators.

STATISTICS published by the US Aerospace Industries Association show that during the year 1960 a total of 7,588 personal and executive aircraft were sold by eight of the major aircraft companies. Although this figure is less than the 7,689 reported in the previous year, the total cash value has increased by $30m to $151,220,000. This is attributed to the facts that more twin-engined types were sold (1,225 compared with 996); and that aircraft were delivered with more instruments and navigation/communication equipment.

Individual totals by aircraft type for 1960 were as follows:—
Aero Commander Model 500, 69; Model 560, 13; Model 680, 70; Model 720, 3.
Beech Model 18, 81; Debonair, 238; Bonanza, 345; Twin Bonanza, 87; Baron, 23; Queen Air, 66; Travel Air, 122.
CallAir A-5, 9; A-6, 4.
Cessna Model 150, 354; Model 172, 1,015; Model 175, 501; Model 180, 283; Model 182, 667; Model 210, 610; Model 310, 290.
Champion Traveler, 33; Tri-Traveler, 72; Sky-Trac, 14; Challenger, 83; DX'er, 19; Tri-Con, 27.
Lake LA-4, 5.
Mooney Mark 20, 172.
Piper Super Cub, 329; Tri-Pacer, 446; Apache, 102; Aztec, 329; Comanche 180, 275; Comanche 250, 469; Pawnee, 363.

CAVALIER 2000 is the new designation of the two-seat executive Mustang produced by Trans-Florida Aviation Inc of Sarasota, Florida. Illustrated in the photographs above, the type is claimed to be the world's fastest certificated private aircraft, and follows five years of research and development on the company's "re-manufactured" version of the Mustang. Powered by a Rolls-Royce/Packard Merlin, the Cavalier has a normal cruise of 370 m.p.h. at 25,000ft and a maximum cruise of 424 m.p.h. at 30,000ft. Empty and gross weights are respectively 7,121lb and 10,500lb. Maximum range is quoted as 2,000 miles. Licensed in the aerobatic category by the Federal Aviation Agency, the aircraft is built to withstand an ultimate load of 9g at maximum gross weight with full tip tanks. Price of the aircraft, with complete instruments but without radio, is $32,500 fly-away Sarasota.

A CLOSER CHECK on the physical fitness of glider pilots is indicated by two additions to the operational regulations of the British Gliding Association. All pilots joining a BGA club are required to sign a declaration of physical fitness before flying solo and, before giving instruction, pilots must have this declaration endorsed by their own doctors. The Association also recommends that the second requirement should apply to all solo pilots, but this is being left to the discretion of individual clubs.

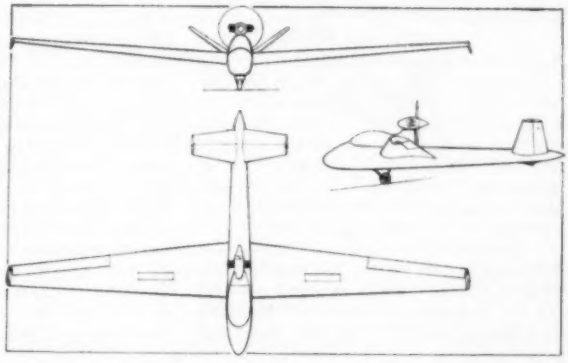
RETROSPECT

From "Flight" of March 4, 1911

Book Here for Flying Trips. Messrs. Keith Prowse and Co., Ltd., have now got their booking arrangements in working order and from a little tariff card, which can be obtained from any of their Box Offices, it will be seen that a short flight can be booked for two guineas, while for a flight of three times round the aerodrome at Brooklands or Hendon with a *vol plané* landing the charge is four guineas. A longer and higher flight can be indulged in for an extra guinea, while the charge for a cross-country trip is ten guineas. Messrs. Keith Prowse and Co. intend to make a special feature of aviators visiting gentlemen's estates and then taking passengers for trips on the aeroplane. In the meantime, it should be noted that the firm are the sole general booking agents for Brooklands and Hendon.

THE NEW LUTON BASE of McAlpine Aviation will include workshops for the repair, overhaul and installation of aircraft radio and navigational equipment. This new department will be headed by Mr Jan de Koning and its services will be offered to outside firms as well as customers of McAlpine. Another part of the Luton premises will be rented to Autair as a centre for the company's charter flights and to support its overseas helicopter operations.

TICKETS are now available for the annual gliding ball organized by the British Gliding Association, which will take place on Friday, March 10 at Londonderry House from 8.30 p.m. until 2 a.m. Tickets cost 25s each including buffet supper, and are obtainable from the BGA at Londonderry House or from member clubs. On the day following the ball, Saturday, March 11, two meetings will be held, one for instructors and the other for club secretaries, managers and treasurers.

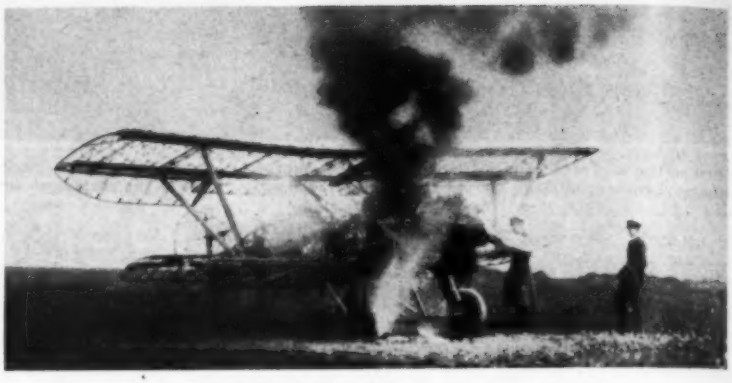


This East German motor-assisted glider, the LA-16, has been designed and built by Prof Landmann of Dresden Polytechnic. Span is 41ft and power is provided by a Koeler M-3 engine developing 40 h.p. Maximum speed is quoted as 87 m.p.h.

Straight and Level

AS everybody knows, the first all-metal aircraft to enter service with the RAF was, as shown in my picture, the Armstrong Whitworth Siskin III. That was in 1924. In those days, unfortunately, *Flight* had not yet produced the first of its world-famous series of engineering cut-away drawings, and nowhere has a picture been published of this historic aircraft in skeleton.

I am now privileged to render this service to posterity.



"I say there old man haven't you got it a bit too rich?"

● *"Humane methods of transporting by air live birds such as firefinches, lovebirds, canaries and budgerigars are recommended in a new British Standard (B.S. 3149: Part 2) which has just been published. Detailed guidance is given on the kind of cages most suitable for transporting various types of small and medium-sized seed-eating birds . . ."*

How about a British Standard for air-transporting economy-class humans humanely?

Meanwhile . . .

● . . . "All Australian airliners will carry a baton and two pairs of handcuffs from May 1, the Department of Civil Aviation announced today."—*Reuter, Melbourne, February 14.*

● A great deal is said about "natural" indications in instruments, but I am delighted to see that pundits are finally admitting that it is extremely difficult to find out what is in fact natural and what is not. Certainly the trained pilot is no longer able to make any clear distinction and, worse still, he can quite easily react to a "natural" indication in the wrong sense.

And now we have to ferret around in the pilot's tangled subconscious with the aid of an "applied psychologist" in order to discover what is really natural and "free from opinion and prejudice." Are not opinion and prejudice themselves natural? In any case, no one presentation will ever fulfil every operational requirement—and as soon as someone finds a new natural someone else clutters it up until it becomes impossibly "noisy" and our nature boy is just as baffled as he was before.

● *From a newspaper report:—*

"A partial explanation might be the loss of aerodynamic qualities by too great a loss of speed. This could have resulted from a failure in the control gear of the tail mechanism. This is apparently confirmed by statements that the aircraft had its nose raised to an unusual extent just before its turn.

"Though this would not explain the breakdown of radio communications with the control tower, it might account for the attempt as a last resort to climb in a spiral to check the loss of speed and reach a safe height. A great deal of mystery still remains, however."

Yes, indeed—and mysteries are sometimes deepened by newspaper reporters (evidently not, in this case, the air correspondent) who haven't a clue about what they are writing.

● *"Last year we earned $8,000,000 in America—not bad for an airline that doesn't fly within 4,000 miles of the place."*—Mr Anthony Milward, chief executive of British European Airways.

Good for BEA.

Speaking on the same occasion, which was his return from a three week visit to the USA, Mr Milward remarked upon the "absolutely fabulous" sums of money that the Americans are expending on their airports. He emphasized that about one third of US airport revenues comes from car parks—the implication being that we in this country should do something to increase revenues from this source.

Mr Milward and his chairman, Lord Douglas, will have to clarify their thoughts on this subject, because they recently opened a campaign to persuade people not to take their cars to London Heathrow Airport.

● Two more thoughts about London Heathrow, in the hope that something may be done before it is too late.

ONE: In this column on May 27, 1960, I begged the Ministry to make London Airport North less of a scandal than it is by displaying posters and pictures and models of the new intercontinental terminal, and apologizing for the temporary chaos at the shanty-town. The Ministry responded, as I was glad to record on July 8, by posting up some friendly notices.

Alas, these are few in number and are in any case scarcely noticeable. And they do not appear at all in that terrible Customs shed, where visitors get their first impressions of this country. So, once again, I beg the airport management to improve its public relations. There is only one more season to go, but it is going to be the most temper-testing ever, and three million first impressions of this country are at stake.

TWO: I do hope our eyes will find delight in the interior design of the new intercontinental terminal at London Heathrow. Let the aesthetically offensive interior of the London Gatwick terminal stand as a monument to modern airport terminal decor as its least inspired.

● Republic Aviation, I am told, are arranging a reunion for former Thunderbolt pilots. Remembering that 15,329 were built and that the aircraft was known to its pilots as "The Jug," I predict that this will be quite a party.

● Caption to diagram in technical handbook on a certain twin-engined executive aircraft of Continental origin: "Electrical panel and dislocation of other equipment."

● I hear that BOAC are to introduce at the end of April commercial radio programmes on their Boeing 707 services. Called Hi-Fli, the programmes will be "interspersed with quality advertising."

* * *

"Hello, folks! Here we are again—the same old spot on the dial! Yes, sir, this programme is brought to you by the writers of Straight and Level, the only column with SRS, the secret ingredient that provides VIABILITY! We bring you now another 15 minutes of smooth listening, to remind you—if you need any reminding—that Straight and Level is the SMOOTHEST column on the market! Yes, sir, the only column with a capability posture concept! The only column written by—yes, you're so right, he's the greatest, the qualityest—yes, sir, here he is, come right in . . ."

ROGER BACON

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BEA carry 26% of Europe's scheduled air traffic—more than 2 million international passengers in a year; and they do so on a sound economic basis, proved by a substantial profit record.
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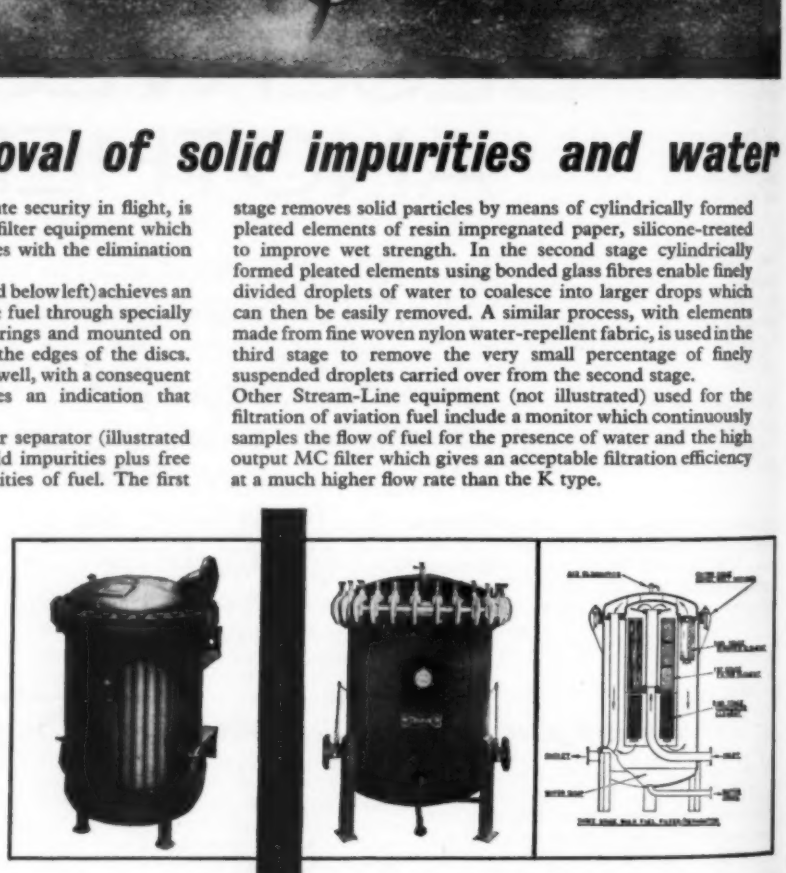
The Stream-Line three stage filter/water separator (illustrated below right) is designed to remove solid impurities plus free and suspended water from large quantities of fuel. The first stage removes solid particles by means of cylindrically formed pleated elements of resin impregnated paper, silicone-treated to improve wet strength. In the second stage cylindrically formed pleated elements using bonded glass fibres enable finely divided droplets of water to coalesce into larger drops which can then be easily removed. A similar process, with elements made from fine woven nylon water-repellent fabric, is used in the third stage to remove the very small percentage of finely suspended droplets carried over from the second stage.

Other Stream-Line equipment (not illustrated) used for the filtration of aviation fuel include a monitor which continuously samples the flow of fuel for the presence of water and the high output MC filter which gives an acceptable filtration efficiency at a much higher flow rate than the K type.



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SF. 10

Introducing the Vanguard

By Captain A. S. JOHNSON
DSO, MVO, DFM
Flight Manager,
Vanguard Flight, BEA

"Flight" photograph

THIS story really began on April 9, 1953, when Mr Peter Masefield, then chief executive of BEA, met Mr G. R. (now Sir George) Edwards, at that time aircraft chief designer of Vickers-Armstrongs, to discuss the outlines of the shape and size of the successor to the Viscount. It is significant that even at that time—just nine days before the Viscount was due to enter scheduled service—there was an appreciation that a much larger and faster aircraft would be required to meet the rapidly increasing traffic.

As a result of this meeting a working party was set up in each organization to study the overall requirements and produce an agreed specification. Within BEA the group came under the auspices of the chief engineer and was led by the chief project and development engineer, Mr Bob Morgan. It consisted of members from each of the departments, which in turn had their own sub-committees working on their own individual requirements for the new aeroplane.

A similar group was also at work within Vickers, examining and accepting or rejecting proposals as they were made. The amount of energy and purpose given to the project might best be indicated by the fact that over sixty separate designs were studied before the final shape was arrived at.

Because of the popular passenger appeal of the Elizabethan, BEA had always favoured a high-wing project, and for a long period the design of the Vanguard (or as it was known then, the 951) was centred around this configuration; but about this time Trans-Canada Air Lines became interested and, because of certain problems in connection with their own operations, were very much against a high wing. This consideration, coupled with constructional problems, eliminated the design in favour of the double-bubble, mid-wing aircraft as exemplified by the Vanguard of today.

All this preliminary work in selecting the configuration of the aircraft took two whole years, and it has been estimated that on Vickers' side alone over 600,000 man-hours were spent in design investigation, while in BEA countless hours were occupied at meetings in discussing the requirements of the project.

By now it was April of 1955 and the real task of building the aircraft began. A full-size wooden mock-up had to be made, jigs designed, materials ordered and sub-contracts established; and it must be remembered that all this activity had to be taken in stride with the tremendous production programme that was in full swing on the Viscount series.

Whilst all this work was going on at Vickers, Rolls-Royce had their own problems in producing the engine—known initially as the RB.109, and later named the Tyne—that was to power the new aircraft. Apart from actually producing the engine, one of their biggest headaches was to find a suitable vehicle in which the engine could be mounted to carry out the vital development flying before installing it in the Vanguard. Eventually it was decided to purchase the prototype Ambassador and a surplus BEA Elizabethan and to use these aircraft for engine development. In addition, for its first few hours' flying the engine was mounted as a fifth powerplant in a Lincoln operated by Rolls-Royce from Hucknall.

It had been agreed that BEA's contribution towards the development of the Vanguard would be to supply the crews required to operate the intensive engine programme which the Elizabethan was to undergo; so I was highly delighted when my boss, Captain Baillie, general manager (flight) of BEA, asked me to undertake the operational responsibilities for this programme. During the next few months many hours were spent with Cliff Rogers at Hucknall discussing the alterations necessary to convert the Elizabethan to a two-crew turboprop aeroplane.

We started flying at Hucknall at the beginning of March 1959, and after a short period of familiarization training moved the centre of operations to Malta in the fond belief that we would have much better weather there than at Hucknall. We stayed at Malta for approximately six weeks and for most of this time it was either blowing a full gale or enormous thunderstorms were passing over the island.

On returning to Hucknall we scheduled an eighteen-hour-day programme, until by the beginning of October we had completed 1,600 hours' development flying on the engines. When one thinks of the normal utilization of a fleet, it is remarkable what can be done when special attention is paid to one particular aircraft. Our mean achievement over the whole of the last 1,500 hours eventually worked out at just over fourteen hours a day, and this was accomplished by five crews working in three shifts of six hours, each six hours being divided into two flights of three hours. The three hours were broken down into a flight entailing a climb to 25,000ft, cruise for 50min, descent into a holding pattern at 6,000ft for ten minutes and then climbing up to 25,000ft, repeating the performance and then landing at the end of the three-hour detail to refuel, this cycle representing an average BEA flight.

G-APEA, the second Vanguard off the line and the first for BEA, taking off from Weybridge on its first flight, April 22, 1959

Introducing the Vanguard . . .

As the aircraft taxied in it was quite remarkable to see the attention paid to it by the factory. A squad of perhaps 20 men would descend on it and give the airframe and engines a thorough visual inspection while it was being refuelled. This would take between 15 and 20 minutes, then the engines would be restarted for another three hours' flight. Most of the flying took place over the Eastern Counties; so any readers who happened to be flying high in that part of the world will now know that they were not dreaming when they thought they saw an Elizabethan at 25,000ft, flying at 300kt-plus.

A point worth mentioning is that the 1,600 hours' development flying were accomplished with a total of four engines; but most of the work was done by two, one of which was flown for over 1,200 hours.

While this exercise was taking place, work was going on apace at Weybridge with the setting-up of a production line and the completion of the first Vanguard. On a wet and windy day in January 1959 I was fortunate enough to be present there when G-AOYW was rolled out for its first flight. Flown by Jock Bryce, who was then Vickers' chief test pilot, and Brian Trubshaw, his deputy, who has now of course succeeded Jock, the aircraft took off from the very short runway after first carrying out a couple of fast taxi runs, and after a successful first flight of 18 minutes' duration landed at Wisley in readiness to go into its development programme. Scheduled to take up approximately 1,500 hours' flying and to be shared among the first five aircraft to be built, this would follow the usual pattern of initial handling assessment, system checks, tropical performance tests and (from the airline operator's point of view perhaps the most important of all) route-proving trials.

Concurrent with the general development programme, there was the necessity to demonstrate the aircraft to prospective customers. The first of these overseas flights took place on May 6, 1959, just four months after the first Vanguard had flown. The aircraft used was in fact G-APEA, the second Vanguard off the line and the very first to appear in BEA colours. The aircraft flew to Hamburg for the benefit of people who were attending a travel-trade fair and during the day many people expressed their admiration for the new airliner. From my log-book I notice that the outbound flight took 1hr 15min and that (in case anyone thinks this was a tailwind flight) we took 1hr 25min for the return journey.

Within the next few months there were demonstration flights to Brussels and Rome. Here, again, I notice that we had a flight time of 2hr 30min outbound and 2hr 35min return—which, bearing in mind the comparative economics, shows up the aircraft in a very good light indeed against the straight jets.

By the end of June there was enough confidence in the aircraft and engines to warrant a trip to show it to the other main customer, Trans-Canada Air Lines, and at the end of that month -EA again left Wisley, this time bound for Montreal, *via* Prestwick and Iceland. Once more some of the flight times make very interesting reading, inasmuch as the first leg from Wisley to Prestwick was completed in just an hour and Keflavik to Montreal in 6hr 25min; and on the return journey the overall time from Montreal to Wisley was 8hr 15min, the final leg, Gander to Wisley, taking only 5hr 30min. During this trip, which included a series of take-offs and landings for TCA pilots—who had never flown the aircraft before, it remained perfectly serviceable for the entire period.

The next of these demonstration flights took place for the benefit of British West Indian Airways and towards the end of March the aircraft once more departed from Wisley and proceeded to Trinidad by way of Iceland, Goose Bay, New York and Bermuda. We stayed overnight in New York and Vickers took the opportunity to put the aircraft through its anti-noise tests for the New

"Flight" photograph

York Authorities. We spent two or three days in Trinidad and the aircraft was fully utilized in demonstrations to practically everyone of note on the island, including most of the BWIA pilots, who had the opportunity of flying the aircraft.

Again during the whole of all these operations there was only minor unserviceability; in fact, the only thing that marred the flight technically occurred at Bermuda on the return journey, when contaminated fuel was loaded into the tanks and it took the best part of two days to get them thoroughly clean again. Bearing in mind the geographical position in which the mishap occurred, I do not think that the crew were too unhappy about this; certainly I was not! Once more the flying times were pretty good, and I note that we flew from Gander to Prestwick in 5hr 35min, having diverted from our destination, London Airport, owing to bad weather.

Towards the end of 1959 the whole of the certification programme was going so smoothly that it was apparent that we would shortly be requiring the services of the BEA pilots who were to carry out the route-proving evaluations. To those uninitiated with the procedure, the object of such an exercise is for the aircraft to operate over a period of 200-300 hours over a typical airline network to airline standards, including schedules, turn-rounds and passenger reaction, and to prove that the aircraft can operate in the ATC network without embarrassment to other users. These trials are normally carried out by the operator for the manufacturer.

Accordingly, a team of ten senior training captains reported to Vickers' ground school at Weybridge for a technical course on the aircraft, having previously spent a week at Derby learning something of the intricacies of the Tyne engine. By the end of February 1960 all was ready for the commencement of the trials and we began operations with a modest flight from London to Paris and Brussels.

Good progress was maintained until the last week of the trials, when we had planned a tour taking in most of the airports in the BEA Mediterranean network. The gods who had been so firmly on our side up to this time now deserted us. After a series of incidents on almost every leg of the journey, we finally completed the tour by crawling home most of the way from Athens on three engines. This was, of course, rather discouraging; but, looked at in another light, it says very much for the stand-by systems and for the performance of the aircraft that we were able to keep going and did not have to call for assistance from our home base. Nevertheless, the problem was serious: it was quite evident that the aircraft was not fit for passenger service with the engines in their state of development at the time, and it was evident that some major modifications to them would be required.

The rest of that story is probably known to most *Flight* readers; Rolls-Royce decided to withdraw the engines from service until satisfactory modifications could be embodied. This decision, of course, affected BEA both financially and operationally. The progress of the Vanguard prior to these setbacks had been so smooth that everyone had been quite confident that the aircraft would come into service at the appointed time, July 1, and account had been taken of this in the schedule planning of operations for the period. However, the corporation in its usual way bore up under the body-blow and, by stretching a bit here and there and by the hire of extra Viscounts, managed to fulfil its obligations to the travelling public.

The development team which had been so looking forward to operating the Vanguard found themselves once again flying two hired Olsen Viscounts on the Paris route for the rest of the summer; and if they achieved nothing else they certainly learned the way to Paris. It is believed that one captain actually reached three figures in the number of flights that he made between the British and French capitals during this period.

By September it was announced that the "fix" had been found for the Tyne engines and that the first modified ones would be installed by the end of the month. The authorities in their

"Flight" photograph

Flight-planning at London Airport for a Vanguard training flight are (left to right) Capt J. I. Pengelley, Sen 1st Offr E. E. Tyrer and Capt R. H. Payne

Introducing the Vanguard . . .

wisdom decided that the 200-hour route programme would have to be repeated, but in order not to waste time it was decided to simulate the route proving by carrying out the entire exercise from Wisley. By flying from dawn to dusk the 200 hours were worked off in a matter of five weeks and on December 2 I reported to Wisley to collect G-APEE for delivery to Stansted, where our team was all ready to go into an intensive training programme.

Apparently reluctant to leave Wisley, the aircraft remained obstinately unserviceable with some minor defect until late that afternoon, when I was ready to leave—except for the Certificate of Airworthiness which was allegedly being signed up in London and had not yet arrived. Hurried telephone calls revealed that the official who was bringing it down would be arriving at Weybridge at 6 p.m. and that, all being well, I could depart at 6.30 with the precious certificate. But at 6.30 the chap had still not arrived and telephone calls to London informed us that he had in fact left his office and should have arrived at Weybridge at the appointed time. The poor fellow finally turned up at 7.30; he had fallen asleep in the train and had been carried on beyond his destination—such is the way of life! However, we soon had things sorted out and by 8 p.m. the Vanguard, flown by myself in company with Captain Chick, departed from Weybridge for the first time with a C of A.

At Stansted we went straight into an intensive training schedule, beginning with the pilots who had been engaged on the development programme and who were, of course, senior training captains. Initially this work consisted of checking the techniques that had been learned during the earlier flying on the type, and of gaining experience of circuit work for those pilots who would later become training captains and instructors to the pilots who would shortly be converting on to the aircraft. Each of these pilots went through this process before being finally put through a full check flight to qualify him for line operation. For the first three days of this very strenuous test of the aircraft, no maintenance of any kind was carried out apart from replenishing the tanks with fuel and oil.

About the middle of the month we interrupted the training programme so that the Vanguard could make a modest contribution towards the Christmas extra services. Before the end of the month we completed 25 operations, ranging from carrying troops home from Germany to taking Scotsmen back to the northern latitudes for their Hogmanay celebrations.

With the coming of 1961 and the completion of the Christmas programme, the aircraft returned to Stansted and we were able to make a start with the conversion of the first of the ex-Viscount pilots who would be transferring to the Vanguard and had by now completed their technical course in BEA's ground school at London Airport. The base conversion programme allowed for approximately eight to ten hours on the base for each captain, and five to seven hours for 1st officers, and consisted almost entirely of circuit flying with variant landings, plus the normal asymmetric work associated with conversions to new types.

By the middle of January the first of these new pilots was reporting back to London Airport for line training. As the name implies, this type of training is aimed at making certain that the pilot, having learned how to handle the aircraft, receives instruction in operating the equipment on routine service. In this particular case it means that each captain will complete a minimum of 12 sectors under training before finally being checked out as competent to operate in command.

At the time of writing we have something like 25 pilots who are fully trained on the Vanguard, and by the beginning of the summer schedules in April we should have approximately 46 ready to go into service. As the bulk of the aircraft will be delivered during the summer, base and line training will have to continue so that we can crew the aircraft as they are delivered, and so extend Vanguard services, both domestic and European.

I suppose the first question that one is asked when discussing a new aircraft is in relation to its handling qualities. As far as the Vanguard is concerned these are in the main excellent, and many of the minor deficiencies that were present in the Viscount have been removed. The aeroplane has much better stability in all three planes and, as one ancient put it, you have only to put her in the slot in an ILS approach and she stays there. Another favourable point is the fact that full landing-flap may be selected at a very early stage on the final approach, so that with the aircraft in the correct configuration, one can concentrate on the approach and landing without having to fiddle with elevator trim in the last stages of the approach.

Two of the most interesting items from the pilot's point of view centre on the flight deck and on the BETA control system which has been introduced on the Tyne engines. I do not think anyone will try to argue that the flight deck is not the most impressive that has ever been produced as a working office for airline pilots. Certainly no Vanguard captain would ever allow anyone to criticize it. It is spacious, everything is within reach of the pilots, all the instruments are grouped in the right places, the seating is very comfortable, and the extremely large windows allow one a view that is truly panoramic.

The BETA control system, I think, deserves a word or two of explanation. All that it really means is that the pilot has direct control over the blade angle of the propellers during certain ranges of the throttles. Unlike the Viscount (which, it will be remembered, has an automatic system whereby the propellers come through from flight idle to ground fine-pitch by the action of micro-switches on the oleo leg), the Vanguard is landed with the throttles at flight idle; then, by removing two safety catches, the pilot is permitted to close the throttles to the ground-idle position, thus inducing a fair amount of drag in the propellers and slowing up the aircraft. In addition to this, further rearward movement of the throttles will turn the blades of the propellers so that increasing reverse thrust is applied as the throttles are moved rearwards.

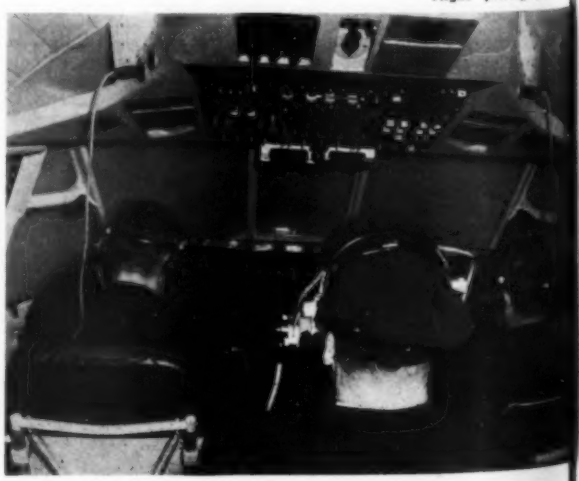
The difference between this system and the conventional reverse thrust is that it is fully controllable and can be applied in exactly the same manner as forward thrust. This facility is, of course, a great boon when taxying and for use after landing, and it is hoped that brake wear will be significantly improved as a result of its incorporation.

By now the reader will, no doubt, have gained the impression that I am very much pro-Vanguard, and he will be perfectly correct in his assumption. Anyone who has had experience of the aircraft would find it difficult not to be.

Commercially, this is a very versatile aeroplane and one which could be used with profit on almost any type of route—although, of course, its economic advantages are really highlighted on sectors of up to 500 miles. Operations can take place in almost any height-band without any undue worry, and the aircraft can operate out of or into almost any field which can accommodate the Viscount.

In these days, with a travelling public turned jet-crazy the commercial experts are tending to turn away from anything which is driven by propellers. Whether they are right or not remains to be seen during the next few years. In the meantime, BEA has now got its feet firmly in both camps, with its fleet of Vanguards now coming into service to reinforce its pure-jet fleet, and must be in a very happy position in the competition for European traffic.

"Flight" photograph



As further Vanguard crews are trained, the General Precision Systems simulator at Heston will have a busy time. Notice the angle of tilt; the simulator also responds to control movements in pitch

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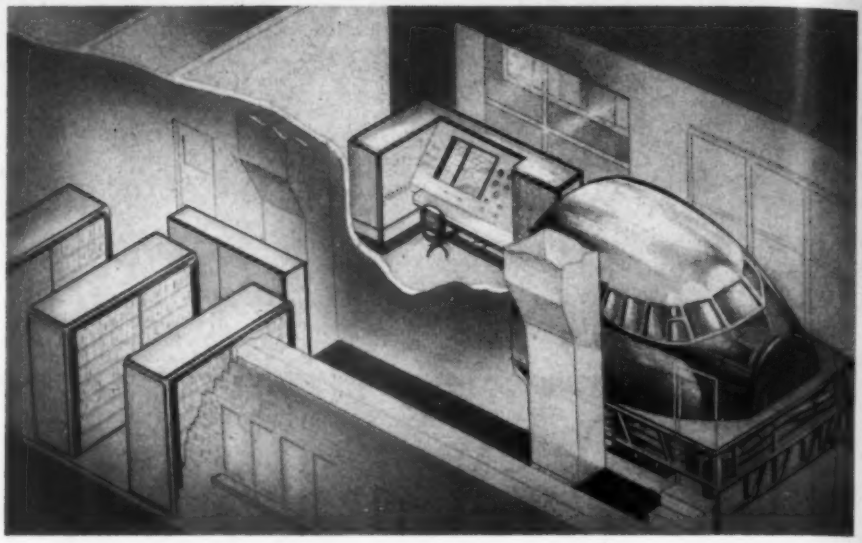

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By PETER WALMSLEY, BA (Cantab), i/c Economics Section, Fleet Planning Branch, BEA

The Vanguard and BEA's Traffic Pattern

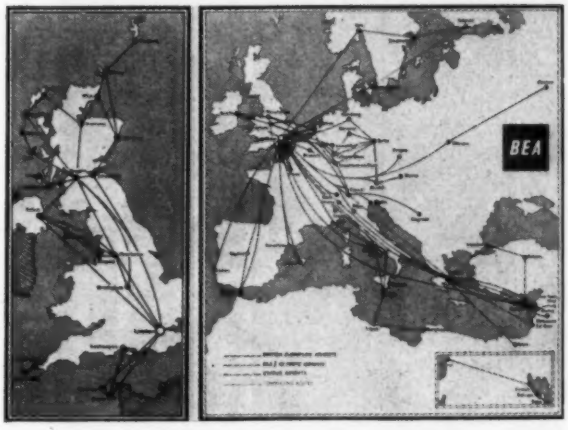
THIS spring sees the start of a new phase in the development of carriage-by-air, with BEA running scheduled Vanguard services both on their international and on their domestic services. A story that started back in 1954 has at last become reality. In this article we shall try to trace the planning that followed through from the initial conception of the project to the present prediction of its future, as seen from the viewpoint of the operator.

The Vanguard is, of course, the latest of the Vickers line of turboprop airliners that first swept into the commercial airline scene in 1950. At that time it was hard to see clearly the dramatic effect the Viscount was to have; but the joint faith of Vickers and BEA was behind the venture, and by 1953 it became evident that the simplicity, the comfort and the economy of the Viscount had firmly established the turboprop aeroplane. Logical steps were started on the stretching of the design; these progressively gave BEA the Viscount 802 series, leading through to the 806 series with its 58 passenger seats, an all-up weight of 63,000lb and 325 m.p.h. cruise performance. This was no mean increase on a design that had started as a 32-seat, 265 m.p.h., 42,500lb gross-weight aircraft flying commercially as the V.630 on the London - Paris and London - Edinburgh routes for a short experimental period in 1950. With the 840, BEA felt that the stretch had been carried to the ultimate, ending the continued economic benefits obtainable from longer fuselages and more powerful engines. So studies were started on the feasibility of a new series of large turboprop short-haul aircraft.

The initial studies were based on the idea of a replacement aircraft that could carry all of its payload either in the form of passengers or as deadload. As the studies progressed it became increasingly evident that if one could settle for the double-bubble style of fuselage this ideal could largely be satisfied. Its value lay in the form of network that BEA operated within Europe. Here was a style of service varying from the seasonal tourist routes of the Mediterranean to the steadily developing internal network of trunk services, all of which had the same problem of dfffering loads of freight requiring shipment. Sometimes there would be short bursts of freight that could be pre-booked; at other times the flow would suddenly fall right away. These were not the sort of routes on which it would be possible to schedule pure-freighter services, and the provision of irregular freighters could not be expected to develop the market. But the provision of an aircraft which was able to provide passenger and deadload capacity in varying quantities at short notice, and without offending the elegance of the passenger cabin, was worth the small penalty of increased structure-weight and drag. In this manner BEA could build up its economy and at the same time explore the overall freight market. TCA was the other leading world airline which might have the same sort of problem, and for Vickers it was a case of selling the Vanguard to the Canadian operator also, in order to justify the establishment of an assembly line for the new design.

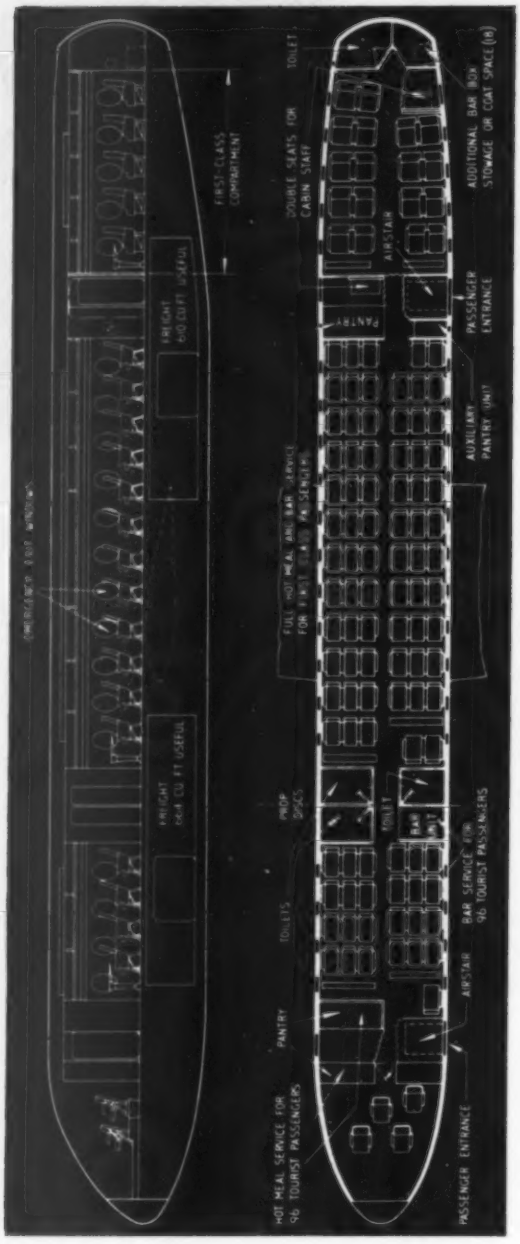
Once the Vanguard specification was firmed-up between BEA and Vickers, design went into full swing. But it was not long before it was realized that the Vanguard could be stretched from its initial 32,000lb payload to a figure of 37,000lb, limited only by volumetric considerations. Such an increase was sufficient to carry the TCA order for a further 20 aircraft, known as the Vanguard 952. But the initial BEA order for twenty V.951s had progressed so far that it was not possible for the increased payload modification to be built-in without affecting the production run. A compromise was eventually arrived at whereby the last fourteen aircraft on the BEA order would be delivered as V.953s by means of modifications incorporated on the production line at a total cost of just under two million pounds. The first six were so advanced that even this solution proved impractical and BEA has yet to decide whether these first six shall be returned later to Vickers for subsequent rebuilding.

Whilst BEA were planning their low-cost replacement, alternative equipment was, of course, being offered to other airlines for European services. Back in 1953 the DC-6B was feeling the first draughts created by Viscount competition. Costwise, this old friend was still producing low seat-mile costs; but as the public learned the comforts of Viscount travel, and as revenue was pulled over to the Viscount operators, this counted for nothing. The short-term answer for 6B operators was to grin and bear it, but the only long-term solution was re-equipment with an aircraft which showed more promise than the Viscount. With the development of the turbine-engine art the initial penalties of the pure jet in comparison with the turboprop were becoming less significant. On the longer hauls, eyes were being turned to the new 707 jet family offered by Boeings. The know-how was there in the form of KC-135 tankers of the USAF, which could prove to any doubter the soundness of the design. And, for the shorter haul, the French had a most promising layout in the form of the Caravelle. We all know how, suddenly, the long-haul operators were fighting each other to order 707s while the other designers were offering competitive types. On the short ranges, the Caravelle fitted into a niche no other manufacturer had filled, and became the choice of several European airlines.



The ready acceptance of pure-jet travel by the public has been keenly felt by BEA. Original policy which followed from the Vanguard order was that a second-generation jet would be ordered to follow the Vanguard as it reached its mid-life point. But the evident success of the manufacturers in obtaining orders for the long-range jets was a dangerous threat to the day when BEA's more powerful European competitors decided to enter the fray within Europe, be it with Boeings, DC-8s or Caravelles. There was only one course left if BEA was to retain its hard-won dominance in Europe: an aircraft with sufficient potential to enable it to run the gamut of this fierce competition.

Fortunately for BEA, de Havilland had the answer to just this problem and were able to offer Comet 4Bs. These aircraft, ordered in 1958, were first delivered in November 1959. The initial order



BEA's standard Vanguard seating plan; small changes may be made as service experience accumulates. The "all-purple" first-class cabin is aft of the rear entrance door. In an all-tourist layout for the Vanguard V.953 up to 138 passengers could be accommodated

The Vanguard and BEA's Traffic Pattern . . .

for six has successively grown to the present fourteen, together with a further four operated by BEA's consortium partner Olympic Airways. These Comets are now being deployed on all BEA's most competitive routes where the traffic and the distances involved require pure jets; routes where, back in 1954, the Vanguard had been seen as the perfect answer. Despite their higher seat-mile costs, the Comets have justified themselves in that they provide the most attractive jet travel in Europe. Being developed aircraft, they are also able to operate at a higher utilization rate than one could normally expect from a new aircraft. This, of course, is a point to value when ordering aircraft and one with benefits that will be passed on to the Comet's younger and lively cousin, the D.H. Trident, 24 of which are due for delivery to BEA for service starting in the summer 1964.

But to return to the Vanguards that were due to be delivered from the autumn of 1959. By late 1957 initial plans had been modified to take account of all the events just described. No longer would the Vanguards be expected to provide the elite of capacity on the continental routes. They would have to survive on a more workaday existence on the less demanding but certainly no less important high-density, short-haul routes. The main demand for these routes comes in the form of an intensely seasonal peak; alternatively, at a lower fare-level there is the steadier demand on the domestic trunk routes. This led to a re-evaluation of the Vanguard, from which it eventually emerged in the form in which it is now entering service. The advantage of this layout is that all twenty Vanguards can offer identical interiors with 114 seats. The latter fourteen "heavy payload" Vanguards are also able to take a further four-and-a-half tons of general cargo, easily stowed together with the registered baggage in the 1,214 cu ft of belly hold.

The 114 seats are normally used in the form of 18 first-class arranged aft of the rear passenger door, with 96 tourist seats in the main cabin. It is interesting to note that the floor area available to the first-class passengers averages out at around ten square feet each. This compares with the nine square feet allowed in the halcyon days of the Great Western Railway's broad-gauge first-class compartments, designed over one hundred years ago!

An all-tourist interior includes one arrangement with 138 seats. For this case only the V.953s can be used, as the weight of 114 passengers and their baggage in a V.951 will absorb all full payload available, the limitation being one of zero fuel weight.

Route Planning

Having settled the basic interior layout, the next step was to finalize the routes on which the aircraft was to begin service in July 1960. Plans were based on a complete coverage of the Paris route for the summer, with the addition of the Malta network in the autumn. The latter included both day and night services transiting Rome or Naples on the way to Malta. This appeared to give a very low rate of utilization; but BEA were simultaneously planning the introduction of Comets, and it was felt too risky to build up both Comet and Vanguard flying at too fast a rate. So while the main effort was devoted to Comets, experience gained by TCA in introducing their Vanguards might profitably be called upon to ease the work of the development engineers.

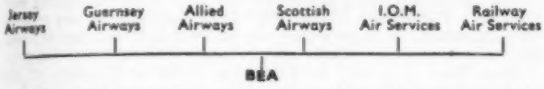
But this was not to be. In the midst of the Vickers certification programme, difficulties arose with the Tyne engines. These prevented the contract delivery programme being met. From the planned July 1960 introduction, dates slipped back towards the autumn and BEA was forced into chartering bare-hull Viscounts to fill the capacity gap that yawned ever-greater as the planned Vanguard capacity failed to materialize. In retrospect, it was one of the happier freaks of fortune that planning, which had based the Vanguard introduction on such a low build-up of flying hours, should have resulted in the need to acquire so little emergency capacity. But at last daylight showed at the end of the tunnel, and the Vanguard was granted its C of A. The first was delivered to BEA in December 1960 and since then crew-training programmes have been under way and station experience had been gained by operation of Vanguards on passenger services scheduled for other types of aircraft. Passenger reactions have been most acceptable; and from March 1 the Vanguards will at last contribute substantially to the European air-travel picture as fully fledged scheduled aircraft.

The routes on which the aircraft is now entering service have changed little from those which were originally scheduled last summer. The Paris route is still the busiest international route that BEA operates, and here the Vanguard will be able to do an important job. Unfortunately, it will need to be reinforced with a DC-7C charter from BOAC this summer. The reason is that, with the absence of Vanguard flying last year, it was not possible to increase engine life between overhauls. This in turn has meant that there are not sufficient spare engines available to cover the overhauls that will be required with the shorter Tyne life. In consequence, the flying hours produced by the Vanguard fleet have had to be limited to the number that can be covered by overhauled-engine availability. The other international routes concerned will be the Malta network as originally planned for 1960. By the time the Vanguard fleet has been delivered and is fully deployed, other international points that are envisaged include Barcelona, Palma, Madrid, Dusseldorf and Gibraltar. But, and more important, the Vanguard, with its big, attractive interior, could not have come at a more opportune time for use on domestic trunk services.

To appreciate the significance of this remark, it is necessary once again to go back into the past. BEA inherited from its predecessor companies a small but vigorous network over the British Isles. These services consisted of the holiday routes of Jersey and

"The vexed topic of weather . . . the value of a design with low approach speeds and consequent low minima . . ."

Guernsey Airways and of Isle of Man Air Services, and they included the socially essential routes of Allied Airways and Scottish Airways:—



All these services have multiplied out of recognition since they were merged to form the network of BEA. But the most significant routes were those of Railway Air Services, which connected the provincial capitals of the British Isles, and which are now known as the domestic trunk routes. When BEA took them over in 1947, they were operated with 18-seat war-surplus Dakotas, together with an odd Junkers Ju52 thrown in for good measure. By 1951 some slow progress had been made. The routes were now operated by 28-seat Dakotas, and 27-seat Vikings. They were planned to continue development with modified 32-seat Pionairs and 36-seat Vikings and then to be intensified with 49-seat Elizabethans.

But at about this time the Chancellor sprang one of his less delightful surprises, by increasing the excise duty on aviation petroleum from 9d a gallon in March 1950 to 2s 6d by March 1952. This was a body-blow that set back the development of internal services by many years. No longer was it possible to foresee a break-even position on these routes whilst existing equipment was in use. The only aircraft that could offer reasonable costs per capacity ton-mile were the coming generation of Viscounts, their paraffin fuel not being subject to tax.

So the decision was made to order turboprop aircraft for expansion of the domestic trunk services. To begin with, it was the Viscount 701 that was chosen, but the choice was altered to the more economical 802, which was to be delivered with 54 seats. Looked at as a high-density aircraft, available at night for all-freight services and by day for the tourist passenger, this machine was destined for the short-haul, high-intensity routes to such destinations as Paris, Brussels, Belfast, Dusseldorf and Glasgow. But again the growth of the air-travel market was dependent on low fares, so the order of the day was low seat-mile costs. This meant that by the time the V.802 was finally delivered and introduced into service in 1957 it had grown up into a 59-seater, with provision for 66 seats at the lowest reasonable pitch. By the removal of pantry equipment the capacity could be further increased to 72 seats.

Here at last was the vehicle that could work the domestic trunk routes at an economical fare. No longer was it necessary to restrict their growth by the artificial limitation of the high fares required to ensure that operating losses did not get out of hand. Now the problem was to match with the required capacity the number of aircraft allocated to the routes. And here was the trickiest part of forecasting. To what extent would the existing average traveller move over to the air? How would the surface carriers retaliate? And what new business would be enticed that had not previously considered air travel worth while?

"Next, the study of surface traffic involved port and station counts, and these quickly revealed that the available existing load was really beyond the capacity of Viscounts"

First, the business traveller was considered. He wanted to be able to leave his home in the morning, fly to the far point, do his day's business and return in the evening. He demanded a good quality of service with a degree of prestige to suit his standing. For him, the first-class service was essential. Before the days of mixed-class aircraft, morning and evening services were first class, with all the other services throughout the day providing the simpler fare required by the tourist-class traveller. Here was the pattern of the service that would be provided with additional aircraft fitted into the integration as the traffic increased. Next, the study of surface traffic involved port and station traffic counts, and these quickly revealed that the available existing load was really beyond the capacity of Viscounts. They were altogether too small to carry the potential without there being far too many aircraft movements. So there seemed to be great merit in a large, economic passenger-carrying vehicle which would be available in the early sixties. There was no need for the ultimate in sophistication: what was wanted, rather, was a dependable and proven type with short-field characteristics, giving low approach speeds and permitting regularity of a high order in bad weather.

Here, then, was the requirement. But already such a vehicle was being considered for BEA. The Vickers Vanguard is a 400 m.p.h.-plus transport seating 95 passengers with provision for good freight loads at times when passenger traffic is low. By 1957, as already mentioned, it had been realized that the original conception of the Vanguard operating the more competitive continental routes had been superseded. But re-working the layout to 114 mixed-class seats meant that it was the right aircraft for the domestic trunk routes. No longer need it be integrated with continental services; it could offer prospects as good as those of the jets on the domestic trunks.

Checks of the theoretical cost per seat-mile when compared with the existing Viscounts showed lower figures. This is indicated in the table of today's actual Viscount and estimated Vanguard tourist-seat costs, from which it can be seen that the Vanguard is in the same cost band as, but cheaper than, Viscounts with maximum seating. Broadly, the 200-mile range may be said to represent Manchester, and the 350-mile range Glasgow, Edinburgh and Belfast, with Dublin falling in between. Experience leads us to hope that the costs estimated for the Vanguard will be reduced when actual figures become available.

TOTAL COSTS PER SEAT-MILE (pence)

	Miles 200	350
Viscount		
701 sixty-three seats	3.7	3.1
802 seventy-two seats	3.9	3.1
Vanguard		
951 one hundred and thirty-eight seats	3.6	2.9
953 one hundred and thirty-eight seats	3.8*	3.1*

*Excludes any allowance for freight capacity of four and half tons.

The table is worked on a 2,000hr annual utilization. One-fifth of the hourly costs are aircraft standing charges and we must plan with the knowledge that any improvement in the assumed utilization will trim down the costs. This means quick turn-rounds, and here again the Vanguard has the necessary potential. The two holds, under the floor of the main passenger cabin, are of just over 1,200 cu ft total capacity. A system of baggage-containing pallets has been installed in a BEA Vanguard, and with the experience obtained from this experiment it is intended to install a proved system in the Vanguard fleet. The value of this plan can be seen when it is realized that fifteen minutes are saved on every turn-round on a day's flying. Such integration on the Glasgow route means that nine instead of eight sectors can be flown, a one-eighth increase resulting in a two-and-a-half per cent decrease in hourly operating costs. In fact, the turn-round problem may soon be

The Vanguard and BEA's Traffic Pattern . . .

limited by the physical aspect of unloading so many people through only two doors.

Turning now to the size of the potential domestic market, in some degree it is necessary to speculate. There is no trouble in counting the passengers travelling by surface, but it is hard to ensure that all those counted in fact travelled the distance ascribed to them. The table gives some estimates of the total return daily traffic from London in terms of average passengers by rail and/or steamer.

RETURN DAILY TRAFFIC FROM LONDON

LONDON to	Summer		Winter	
	Air	Surface	Air	Surface
Manchester	500	1,500	250	1,000
Glasgow	600	1,200	350	650
Edinburgh	400	800	200	450
Dublin	550	1,100	240	480
Belfast	350	450	200	200

In addition to this traffic, there is a large motor-coach-travel market. This, however, appears to be so seasonal at the present that there is little hope of providing a fare low enough to induce a change of carrier. The table of one-way fares shows the range of existing second-class tariffs by the principal carriers, excluding any additional meal costs for surface travel.

ONE-WAY FARES

LONDON to	Air		Rail/Boat or Rail only	Coach/Boat or Coach only
	Winter	Summer		
Manchester ...	57/-	57/- to 97/-	38/6	16/-
Scotland	83/-	83/- to 140/-	72/-	42/-
Dublin	129/-	115/- to 153/-	69/6	45/-
Belfast	83/-	83/- to 140/-	70/6	46/-

The table of fares suggests that as far as the Ulster winter traffic is concerned, there is no reason why any traveller should be prepared to tolerate the time-consuming boat journey across the Irish Sea to Belfast. It is, however, evident that the Dublin fare-structure is still too closely allied to the IATA model; and the figures of the traffic moving by air as opposed to surface confirm that the Dublin winter fare needs to be well reduced. The summer fares seem to give rather the opposite picture, with far too peaky an operation taking place on the Dublin routes. This is because of the absence of a properly graded fare-pattern, which is needed to develop the winter traffic and to sell the traveller on the benefits of air carriage.

Speaking broadly, we could say that roughly half the Belfast traffic is now moving by air and that, taking into account the rate of transference from surface to air, the next three years will see the virtual monopoly of air carriage for the London - Belfast journey. In the case of the Dublin traffic, this period should more likely be extended to five years provided that the fares are brought into line with those that are paid for similar travel on the domestic trunk routes. It is no good telling a passenger for Ireland that he will have to pay 32s more in the summer and 46s more in the winter to travel to Dublin than to make the longer journey to Belfast.

The case of the Scottish services to Glasgow and Edinburgh suggests that here the air passenger will have less tendency to select the more speedy form of travel, as the discomfort and loss of time on a sea crossing is no longer the airline's salesman. It has been suggested that somewhere around a third of the total rail and air traffic is currently moving by air and that virtually all of this is amenable to air carriage. The Manchester route is one of the most buoyant. It has the interesting feature that it is a route where the air fare as a percentage of the rail fare is much higher than on the longer routes over the border. And, of course, the saving of time is only evident to those whose residence or office is close to a terminal airport. But, despite this, the lusty growth of the Manchester route leads to the prediction that Manchester, Glasgow and Edinburgh air traffic will have the advantage over surface (except coach) travel before the next five years are over. By that time it should be possible to foresee prospects of helicopter travel for the shorter domestic journeys rather more clearly.

From these predictions, one thing stands out clearly. The present BEA Vanguard fleet has arrived on the scene at the right time to do an immensely promising job. The 20 Vanguards that are available will, as they are replaced on international services by Tridents, have the capacity to carry the increased domestic load. This does not make any allowance for increased overall travel consequent on the improved standard of living in the British Isles. But here one must stress the importance of ensuring that the flow of traffic is sufficiently remunerative to cover the fluctuations between the weekends and the midweek, the summer and the winter.

Off-peak summer services which, using the existing aircraft at the beginning and at the end of day, are able to add another round trip to their day's work without using more staff, are valuable. These are the services that were introduced by BEA on their domestic trunks from spring 1960 and which have, excepting in peak summer, permitted the retention of the old £4 single fare (£4 3s from April). They are also operated on the Dublin route but without such a seasonal fare reduction in the spring and autumn. The spread of the traffic travelling through the week is also important. It is axiomatic that an even flow will enable lower resources to cover the traffic requirements; but, in the case of these routes, there is a built-in stabilizing factor in the form of the businessman who wishes to travel on the five working weekdays, and who at the weekend is replaced by the private citizen travelling in his own time. With the gradual elimination of surface traffic on these routes we must expect a greater weekly and inter-weekly fluctuation of traffic than has hitherto been found. This tendency can only be counteracted by the use of excursion fares to encourage transference of passengers to the less favoured services. And there is, of course, no reason why part of such a problem cannot be solved by the movement of freight in the Vanguard holds at the less popular timings: again, of course, this is a question of suitable tariffs.

Another important point is to ensure that the services provided through the day are suitably controlled so that the minimum of trouble is required to arrange reservations on the flight of choice. Here is where the new electronic reservations machine that BEA is now ordering will allow fast and accurate control. This, linked with the ability to provide adequate extra services when demand outruns supply and the provision of acceptable car-hire facilities, will give the public a sense of assurance in transferring their travel mainstay from surface to air. Together with this knowledge of space available must come the reassurance that weather and engineering delays will become less and less likely. The vexed topic of weather delays cannot be solved until the experimental systems now operating are installed and tried in regular operations. And they will then need to be fitted in identical manner at all the fog-ridden airports throughout the world. This means that price of installation, maintenance and operation will need to be low. Add to this any equipment required to be fitted to the aircraft and it looks as though the Vanguard will not be equipped with all-weather landing aids until the latter end of its life. This proves the value of a design with low approach speeds and consequent low minima, until the advent and general adoption of these automatic aids.

Finally, the intending passenger must be able to "go-show" and board the aircraft up to the last moment without causing any delays to the scheduled departure. This is not a thing that the present airport buildings at Britain's major airports allow. Only at Gatwick do we have the finger-and-gate system that allows these final adjustments to the load at the boarding gate. The answer to airport buildings is one which only an active community interest will solve. It is up to the citizens of each and every major city in these isles to ensure that whatever authority is responsible for operating *their* airport, it is kept running on its toes.

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A1643

SERVICE AVIATION

Air Force, Naval and Army Flying News

Allied Air Forces Central Europe at work, during a recent defence exercise (this page, last week): Sqn Ldr E. F. LeConte, RAF (right), weapons assignment officer, being assisted at the Sector Operations Centre communications board by Flt Lt Homan, RCAF (left), and 1st Lt B. Auland of the Royal Danish Air Force

Examining the Mirage

FOLLOWING the Australian decision to buy Dassault Mirage IIIs as Avon-Sabre replacements (*Flight*, December 30) a technical delegation from the RAAF has been sent to Paris, as briefly mentioned last week, for discussions with the Ministry of Armed Forces and to make contact with Générale Aéronautique Marcel Dassault. The company state that comparative tests of powerplant (SNECMA Atar or Rolls-Royce Avon) are to be made, other RAAF specialists examining the armament and electronic system ordered for the French Air Force. The RAAF mission is remaining in France for about three months.

Cranwell to Aden

A DISTINGUISHED war record and close associations with the formation of the V-force mark the career of Air Cdre L. MacD. Hodges, CBE, DSO, DFC, who has just taken up a new appointment as Air Officer in charge of Administration at Headquarters, British Forces Arabian Peninsula, Aden. Until recently he was Assistant Commandant of the RAF College, Cranwell.

During the war he won the DFC twice (the first time in 1942, after having been shot down over France in 1940 and getting back to England after a brief internment) and the DSO twice. His second award of the latter decoration came when he had completed two operational tours as CO of No 359 Sqn in South-east Asia, having participated in "special duty" operations over Burma, Siam and French Indo-China and flown several long-range sorties to Malaya.

In 1953 he commanded the RAF team entered for the London - New Zealand air race, setting up a new record in his Canberra for the leg to Ceylon, where he was delayed by mechanical trouble. He spent a year with Vickers-Armstrongs (Aircraft) during the later stages of the Valiant's development, then became CO of the operational conversion unit at Gaydon where the first V-bomber crews were trained, then CO at Marham. He commanded the Valiant detachment which represented the RAF in the Strategic Air Command bombing and navigation competition at March AFB, Cal, in 1958.

Posted to SHAPE

AN equipment officer of long experience, Air Cdre R. G. Seymour, CB, CBE, has become Deputy Assistant Chief of Staff (Plans and Material) at Supreme Headquarters Allied Powers Europe. He was until recently Director of Equipment (B) at Air Ministry and prior to that Senior Equipment Staff Officer at Coastal Command Headquarters.

Mechanist Aviators

A PILOT who answered a *Flight* advertisement in 1911 and as a result became one of the founders of the Australian Flying Corps, forerunner of the RAAF, recently returned to Australia after 45 years' absence. The advertisement asked for two "mechanist aviators" to go to Australia to found a military flying school, and it was answered successfully by Mr Henry Petre and Mr Eric Harrison. Mr Petre, who has recently been back to Australia, and Mr Harrison took two Deperdussin monoplanes, two BE2as and a Bristol Boxkite. Mr Petre assumed command of the Aviation Instruction Staff and Central Flying School at Point Cook in February 1914, subsequently commanding the first wing of Australia's air force to go into action. He left in April 1915 as CO of the First Half Flight (forerunner of the RAAF) en route for Mesopotamia. In action against the Turks he won the DSO and MC and was thrice mentioned in despatches.

Fearing No Man

EQUIPMENT with English Electric Lightnings last year meant that No 74 Sqn (motto: "I fear no man") became one of those illustrious few squadrons who have been the first to receive famous fighter aircraft: in pre-war days it was Nos 111 and 19 Sqns who could boast of giving the Hurricane and Spitfire, respectively, their Service debut in 1938; and in 1954 a similar distinction could be claimed, with the Hunter, by No 43 Sqn.

It is perhaps appropriate that No 74 should be first with the Lightning (described in *Flight's* report last week of a visit to the squadron at Coltishall as "one of the fastest and most potent defensive weapon systems yet developed"), for the unit has a great fighting record in two world wars. During its first two months in France as part of the Royal Flying Corps it destroyed 70 enemy aircraft for the loss of only one of its own; in eight months its tally of German machines had risen to 140, plus another 90 sent down out of control. For a time the squadron's "A" Flight was commanded by Maj Edward Mannock, VC. Highest-scoring British pilot of the First World War, he gained a DSO and two Bars to it while serving with No 74.

The unit was soon in contact with the enemy in the Second World War, three of its Spitfires engaging a Heinkel He 111 on November 20, 1939. In June the following year Flt Lt A. G. ("Sailor") Malan, shortly before he became CO of the squadron, destroyed two He 111s one night during the first big German raids on England; and in November 1940 the unit was officially credited with 26 enemy aircraft. Later in the war it operated in the Middle East with

Rarin' to go: a Blackburn Buccaneer positioned for take-off during trials in HMS "Ark Royal." The RN Intensive Flying Trials Unit for these aircraft, 700Z Flight, is to be commissioned this month at RNAS Lossiemouth

SERVICE AVIATION . . .

Hurricanes and then Spitfires; after returning to the UK in early 1944 it became part of the tactical air forces supporting the invasion of Europe.

Like his illustrious predecessor "Sailor" Malan, the present CO of No 74 Sqn is a South African: Sqn Ldr John F. G. Howe took over command in February last year, after being a Hunter pilot with No 43 Sqn. He joined the RAF in October 1954, having previously flown with the South African Air Force. He served with the SAAF in Korea and at the end of his tour (in 1951) was attached to the US Infantry; he holds the American DFC and Air Medal. After joining the RAF he became a QFI, and in 1956 he was posted to No 222 Sqn for a year. At last year's Farnborough Show he led the formation fly-past by No 74 Sqn.

The unit's present base, RAF Coltishall, is also the home of No 23 Sqn—now equipped with Gloster Javelin FAW.7s—from which it was re-formed (with Hawker Demons) in 1935. The station is commanded by Gp Capt H. A. C. Bird-Wilson, DSO, DFC, AFC.

Ahlhorn Associations

A REUNION comprising two squadrons and a wing is being held next month: for officers and aircrew who served with Nos 96 or 256 Sqns, including station officers with No 125 Wing of 2nd TAF at RAF Ahlhorn, its venue is Oxford UAS headquarters, Manor Road, Oxford, on Saturday, April 15, at 7.30 pm. Remittances (£1) should be sent to Flt Lt R. D. Bates, RAF Pitreavie Castle, Dunfermline, Fife.

". . . shoot into the dark Arrows of lightnings": the Tennysonian line is not unapt for the arrow-like configurations of No 74's aircraft as the squadron wheels into a formation turn

No 74 Sqn machines on parade at Coltishall. In the background (left) can be seen some of the Javelin FAW.7s of No 23 Sqn. These aircraft are also armed with D.H. Firestreak

IN BRIEF

The Air Minister, Mr Julian Amery, visited Supreme Headquarters Allied Powers Europe last Friday.

Royal Air Force News, the first-ever RAF newspaper, is to begin publication on March 22. Appearing fortnightly, it is to have a 12-page tabloid format and will cost 3d.

No 2 (AC) Sqn are holding a reunion dinner in London on April 14. Tickets (21s 6d) and further details from Flt Lt A. J. Gunn, Officers' Mess, RAF Jever, BFPO 25, Germany.

Over 25,000 cadets from the ATC and air sections of the CCF are to attend seven-day camps at 44 RAF stations in the United Kingdom over the Easter period and between July and September.

An illustrated brochure, *Royal Air Force Calshot 1913-1961*, has been published to mark the closing-down of the station (*Flight*, last week). Editing and production were the work of Flt Lt R. A. Bradley, Education Section, RAF Calshot, Hants.

Gp Capt F. O. Soden, who for a short period during the last war (December 1940 to June 1941) commanded RAF Biggin Hill, died recently in London at the age of 65. He won the DFC while serving with the Royal Flying Corps in the First World War, and a Bar to it for RAF operations in Kurdistan in 1922. During the last war he also commanded Upper Heyford and Castel Benito, Tripoli.

RAF Eastleigh, near Nairobi, Kenya, is to become the first RAF station overseas to be adopted by a local authority, in this case the Nairobi County Council. The airfield was opened in 1940 and used as a base for aircraft operating in the 1941 Abyssinian campaign. Until 1959, when Nairobi civil airport opened, it was joint-user. Three squadrons are now based there, Nos 208 (Hunters), 21 (Twin Pioneers) and 30 (Beverleys).

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

BUA's Jet Plans

I SHOULD like to make two comments on the "British United's Jet Challenge" article in *Flight* of February 10. In the first place you make the unexceptionable statement that the Air Transport Licensing Board should be perfectly clear about facts and figures produced by airlines in support of applications for new routes. I entirely agree—though none of us here has ever had the slightest doubt that the Board would, as part of its normal duties, investigate and analyse the figures supplied by us and other applicants.

This brings me to my second point. When the Board comes to consider figures supplied by us, we are confident it will find correct our assertion that "to carry out our plans in their entirety would involve no more than 20 per cent of the Corporations' estimated traffic *growth* for the years 1961-65."

Our proposed jet fleet would, we hope, be fully operational and flying at a 60 per cent load factor in the year 1964-65. The proportion will then be the 20 per cent we mention, provided that the annual passenger increase of the Corporations is the anticipated 14 per cent. *Flight's* calculations, given in the issue of February 10, are based on a cumulative total over the next four years. No wonder the two figures are so very different.

Our aim in making the statement which has led to this disagreement has been to show that our application will have no effect whatever on the existing traffic of the Corporations, and only a small effect—one-fifth—on the Corporations' prospective growth up to the time our services become fully effective.

London W1 F. A. LAKER,
Executive Director, British United Airways Ltd

AS you commented in your February 10 issue on the letter you were good enough to publish from me, may I comment also? Surely you are not suggesting that it is to be deplored that BOAC should pool with the Commonwealth airlines you mention? I often read or hear of suggestions that the Commonwealth airlines should co-operate, even more closely than they do now, partly in order to meet the competition of, say, Air Union. It seems to me that the passengers as well as the Commonwealth carriers must benefit from arrangements which link the Commonwealth operators and thus help to provide more adequate and better scheduled services for the public than would be possible if all the Commonwealth operators were in fierce competition with each other—perhaps uneconomically, too.

Doubtless you are right in saying that BOAC's strongest stimulus comes from TWA and PanAm; but I have always gathered that such airlines as KLM, Air France and SAS, to mention only three, are also in severe competition with BOAC on various routes and give this Corporation "stimulus." As to BEA, my impression is that pooling arrangements they have with their European competitors have benefited the customers rather than causing disadvantages.

I remain interested to know whether the independents intend to provide "stimulus" to the corporations only on those routes on which the independents are likely to make money and on which the corporations have spent much time and energy throughout the years in developing traffic—or whether they plan to apply for permission to fly on routes on which it would be difficult to make a profit, even though it is in the national interest to have on such routes a British air service.

London W13 A. L. WATSON

The Third Instrument

IN his article "The Third Instrument" in *Flight*, December 2, Alastair Pugh concluded that a fully automatic fuel injection system is needed for light aircraft engines. Apparently Mr Pugh is not familiar with the fully automatic gasoline fuel-injection system which has been available on a number of British aircraft engines for the last twelve years and is an outgrowth of the automatic system which has been fitted on all Rolls-Royce Merlin engines since 1945. The fully automatic speed-density S.U. series fuel injection system is currently fitted to the Blackburn Cirrus Bombardier engine, the de Havilland Gypsy Major 200, and some series of the Alvis Leonides Major.

Simmonds Precision Products Inc, licensee for this system from the S.U. Carburetter Co Ltd, have been manufacturing the S.U. series fuel injection system in the United States for use on air-cooled ordnance engines for approximately eight years, during which period more than 20,000 systems have been manufactured. In addition, we have been in production for several years of two different versions of this system for use on Lycoming aircraft engines being fitted on a production basis to the Aero Commander 680F and the Beech Twin-Bonanza and Queen Air. The system supplied to Beech is fully automatic, based on the speed density metering principle, and includes compensation for exhaust back pressure variation as mentioned by Mr Pugh in his article. The 580-series system for Aero Design is completely automatic and in addition provides a manually controlled mixture-control and fuel cut-off provision. Although Continental do not currently use this system on their aircraft engines, they are intimately familiar with it, having used it on all of their aircooled gasoline tank engines.

Now that Rolls-Royce plan to manufacture Continental aircraft engines, presumably they will be able to turn to their regular source for automatic piston-engine fuel-metering systems, namely the S.U. Carburetter Co, and obtain a fully automatic gasoline fuel-injection system for these Continental engines, with all of the advantages which gasoline injection provides on the aircraft engine.

We are pleased to see that the British Press is alert to the advantages to be gained from automatic fuel-injection systems. Completely automatic gasoline fuel-injection systems to satisfy the requirements expressed by Mr Pugh are already in existence and immediately available to any and all aircraft engine manufacturers.

Tarrytown, NY SIMMONDS PRECISION PRODUCTS INC,
Geoffrey R. Simmonds

[Alastair Pugh comments: "Mr Geoffrey Simmonds' letter is most welcome, although for him to say that I advocate fully automatic fuel-injection for light aircraft engines is not quite correct. I gave equal weight to compromise possibilities in which some type of mixture-setting lever and instrument were required, the only proviso being that setting should be obvious and that the solution be 'cheap and simple.' If fully automatic systems can be made cheaply enough and simply enough to be suitable for all light aeroplanes, and not only the more powerful types that Mr Simmonds mentions, they should be welcomed. But they are not fitted now, and from what I have seen of fully automatic, beat-as-they-sweep-as-they-clean fuel-injection carburetters (on an adjacent drawing-board, Mr Simmonds) I conclude that something less complex is needed.

"Since writing 'The Third Instrument' I have come to favour for smaller engines a system which includes automatic altitude compensation only and in which the other variables are measured and piped to a rich-weak indication on an instrument. The mixture lever would then be used merely to zero the reading."—Ed.]

Why Explore Space?

I AM a rather puzzled reader of your worthy magazine, and wondered if some of your other readers could give me advice.

A main topic in *Flight* lately has been that of spaceflight. But I fail to see, with the world getting more complicated each year, that travel into space is at all necessary or practical. It is presumably the result of man's desire to know and pursue things, combined with a spirit of adventure. Eventually, this could bring the world to a disastrous end.

I am very interested in new discoveries, but there should also be a sense of proportion. Why is it necessary to keep half the world in poverty, while the big countries spend millions of pounds on space activities?

Even if all this money were not spent on spaceflight, it would presumably go towards other "scientific" discoveries and not towards relieving the world's poverty. Is this not selfishness rather than science, and is it not a most depressing prospect?

Why do the big nations refuse to use their means and their authority along more humanitarian lines?

Manchester 16 DIANA SINGLETON

Do-It-Yourself Escape (3)

THE Danish biplane seen by Mr D. Hattersley Smith at Turnhouse in 1944 ("Do-It-Yourself Escape (2)," Correspondence, February 3) is no doubt the Gipsy Moth OY-DEH in which Lt Per Perch flew to Britain on October 19, 1942.

Before the war Perch operated a flying school, but this was forced to close down when Denmark was occupied by Germany on April 9, 1940. Perch then began to work for the Germans, to the amazement and anger of his friends. His purpose was, however, to collect information about German military installations, and when he escaped he brought with him plans of German fortifications in Jutland.

I don't know where he landed, except that it was near the English-Scottish border. To his great disappointment Perch was not allowed to enter the Royal Air Force and spent the remaining war years as a private in the Royal Engineers.

After the war, the Gipsy Moth returned to Denmark, and it was much flown in the years up to the mid 1950s. It was then left in the open at Sonderborg aerodrome, where it slowly rotted away. The remains were finally broken up last year. What a shame! It ought to have been preserved for inclusion in an aviation museum.

The above-mentioned Gipsy Moth was not the only Danish aircraft to escape during the war, for on June 21, 1941, two

CORRESPONDENCE . . .

lieutenants of the Naval Air Service "stole" Hornet Moth OY-DOK (c/n 8065) and flew to England, where they both joined the Royal Air Force. Their names were Kjeld Petersen and Thomas C. Sneum. The Hornet Moth never returned to this country; perhaps one of your readers can tell me what became of the aircraft?

Charlottenlund, Denmark. HANS KOFOED

Malaya to Middle Wallop

I TOO have read with interest Capt Somerton-Rayner's articles on his flight from Malaya to Middle Wallop, but if the gallant gentleman is going to do it again, he will really have to buy some new maps or make a closer study of geography. In Part One he thought that he was over the Burma/Siam railway when he was north of Akyab. Actually the Burma/Siam railway is at least 200 miles east of there, the terminus being Chiengmai. I think I am right in saying that there never has been a railway of any kind north of Akyab and the scar in the jungle was probably one of the roads which run through tunnels in that part of the world. Incidentally, there is no such place at Sandaways. Fort Sandoway perhaps?

In Part Two the captain found himself over Mingaladon "north of Karachi." When I was last in that part of the world Mingaladon was north of Rangoon, which must be at least two thousand miles from Karachi.

These probably are not madly important points to an adventuring author, but I hope he never gets to be CIGS.

London EC3 B. J. HAIMES

FORTHCOMING EVENTS

Mar	8.	RAeS (main lecture at Chester Branch): "Low-speed Problems of High-speed Aircraft," by A. Spence and D. Lean.
Mar	8.	Kronfeld Club: Photographic Exhibition, BBC TV film and talk by F. N. Slingsby.
Mar	9.	Radar and Electronics Association: "Air Traffic Control," by Arnold Field.
Mar	9.	Guild of Air Pilots and Air Navigators: Meeting for Professional Licence-holder Freemen.
Mar	10.	British Gliding Association: Annual Ball.
Mar	10.	Guild of Air Pilots and Air Navigators: "The SC.1," by T. W. Brooke-Smith (at ETPS, Farnborough).
Mar	11.	British Gliding Association: Annual General Meeting.
Mar	13.	RAeS Historical Group: "Evolution of Transport Aircraft," by Peter W. Brooks.
Mar	15.	Kronfeld Club: "Collision Experiments with Wire Barrage Weapons," by Gp Capt Kent.
Mar	16.	RAeS Astronautics and Guided Flight Section: Symposium on "Training of Guided-missiles Engineers."
Mar	17.	RAeS Man-powered Aircraft Group: "Power Transmission Systems," by S. S. Wilson.
Mar	17.	Institute of Navigation: "The Long-term Plan for Air Traffic Control," by Capt V. A. M. Hunt.

RAeS Branch Fixtures (to Mar 10): Mar 6, *Derby*, "Discoveries from Satellite Orbits," by D. G. King-Hele. Mar 8, *Bristol*, a.g.m. and Film Show; *Chester* (see above); *Christchurch*, "Design of Plastic Canopies for Supersonic Aircraft," by J. F. Russell; *Glasgow*, (Graduates' and Students' Section), Open Night; *Southampton*, "Nuclear Propulsion for Aircraft," by A. D. Baxter; *Southend*, "Navigational Aids," by BEA staff member; *Weybridge*, "Protection of Aircraft Against Fire and Explosion Hazards," by J. R. Stevens. Mar 9, *Cheltenham*, "D.H.121," by J. W. Wilson; *Isle of Wight*, "Man's Survival Equipment for his Voyage to the Moon," by P. W. Fitt. Mar 10, *London Airport*, Third Sir Richard Fairey Memorial Lecture, "Sailing," by Uffa Fox.

THE INDUSTRY

Multi-purpose Test Rig

A UNIVERSAL pneumatic rig for the testing of various aircraft components has been developed by Aircraft Ground Equipment Ltd, Blackswarth Road, Bristol 5. Known as the Type HPT 8000 high- and low-pressure air test rig, it gives a range of variable pressures ranging from 0.1mm Hg vacuum to 8,000lb/sq in and incorporates full pressure and flow indication. Four separate test supplies are available, each being fully metered and controlled. A range of pressure gauges, flowmeters and manometers give an accurate indication when performing checks and tests and can be used separately or in conjunction with the supplies.

More Aircraft Glass

AT a total cost of some £33,000, the aircraft glass department of the Triplex Group at Kings Norton has been virtually reformed and its capacity for the production of gold-film-heated panels greatly increased. The rigorous quality-control system and the numerous stages of highly skilled working required to produce some of the special aircraft windows have been streamlined and applications have been diversified to cover gold-film-heated windscreens for diesel locomotives and armoured glass for a variety of other non-aircraft applications.

A new £13,000 vacuum vessel for gold-film depositing has been installed and can treat curved as well as flat panels. New techniques have allowed production of large panels to withstand cycled cold-soaking down to temperatures of −80°C and a new mounting process has been developed, utilizing Thiokol synthetic-rubber surrounds moulded to the edges of the panel. The rubber acts as a buffer between the glass and the aircraft structure and allows mounting without the application of any further adhesives. Fine-wire control elements, busbars and special terminal blocks are also applied to the surface and edges of the glass.

A completely new assembly room has been built to provide dust-free, air-conditioned facilities for assembly of glass and Vinyl interlayers. Gold-filmed glass can be passed directly from the vacuum section to the assembly room without meeting unfiltered air. The process of grinding curved panels has been simplified so that both tool wear and time are saved. Extremely close inspection of special windows for optical qualities has been maintained. Triplex state that they manufacture 95 per cent of the aircraft glass in Britain, for a range of aircraft which include all three V-bombers, Buccaneer, Lightnings, Sea Vixen, Hunters, Viscount, Vanguard, Trident and VC10.

The new vacuum deposition vessel at Triplex (see above)

IN BRIEF

Appointed managing director of Sir George Godfrey & Partners (Australia) Pty Ltd: Mr A. F. Bandidt, formerly Far East representative (based in Melbourne) of Handley Page Ltd. Seconded from the RAAF, he served in the RAF from 1934 until his resignation in 1947 to join Handley Page. In 1946 he made the first post-war solo flight from the UK to Australia, in a Miles Gemini

Mr H. G. Dorn, MSc (Econ), has been appointed contracts manager, Vickers-Armstrongs (Aircraft) Ltd. He went to Weybridge in 1953, has been concerned with guided weapons supplies and in 1959 was made military contracts manager.

Mr J. W. Baxter, a Fairey Aviation Ltd assistant cost accountant, has been awarded the Donald L. Moran Prize by the Institute of Cost and Works Accountants.

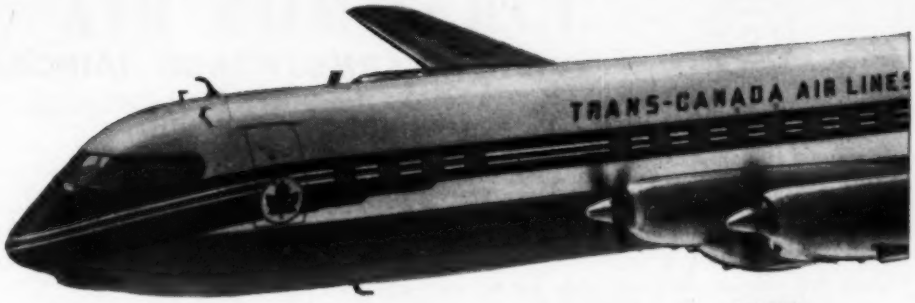
Chance Crookes sunglasses, referred to in our issue of February 10 as having been recommended by BEA for use by their pilots, are made by the Chance-Pilkington Optical Works, St Asaph, Flintshire.

Controls Company of America have formed a British subsidiary, Controls Company of America (UK) Ltd, which will be under the direction of the organization's Canadian subsidiary. Activities by the parent concern include work in the aircraft and guided missile industries.

Hall Engineering Ltd, Shrewsbury, one of the Hall group of companies, have received a contract from the Ministry of Works for a M7 wind tunnel for the aerodynamic division at the NPL, Teddington. This is the fifth wind tunnel contract placed with Hall in recent years.

A. J. Whittemore (Aeradio) Ltd, Biggin Hill Aerodrome, Biggin Hill, Kent, have just completed a test equipment overhaul and repair workshop for the repair, overhaul and certification to ARB and AID standards of equipment such as beat frequency oscillators, oscilloscopes, and frequency, wave and output meters. This is believed to be the first such overhaul and repair shop to be established by an independent engineering firm.

Changes in the financial division of the Goodyear Tyre & Rubber Co. (Gt Britain) Ltd have been announced. Mr I. Thomsen will become financial director and secretary; Mr L. A. Gibbs, assistant secretary, will henceforth be recognized as an executive officer of the company and will act in the absence of the secretary as his appointed delegate and alternative signatory in respect of legal and corporate matters; Mr D. G. Birch is to take over the office of treasurer with Mr J. N. Law as assistant treasurer; and Mr N. H. Smith will become the newly appointed comptroller, responsible for all the company's accounting activities, with Mr D. N. Corner as assistant comptroller.



TCA VANGUARD fleet lands on Goodyear

Goodyear tyres, wheels, brakes and anti-skid equipment have been specified for T.C.A's fleet of Vickers Vanguard type 952.

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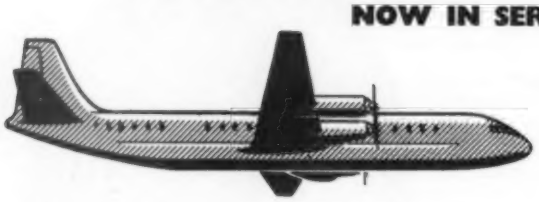

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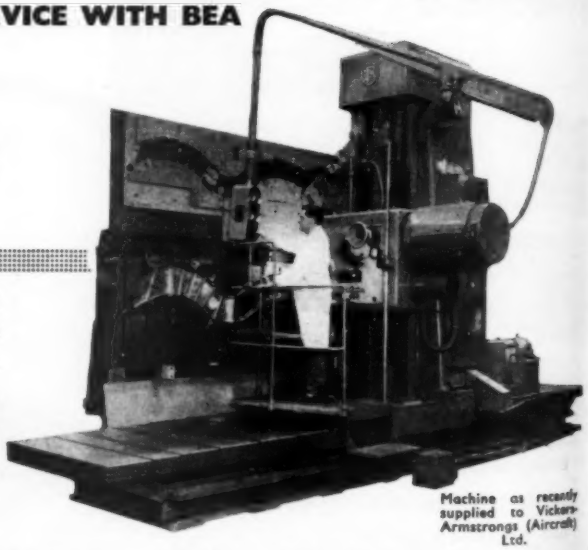

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AIR COMMERCE

Jet Insurance Probe—a US Investigation

INTO our hands has come the full proceedings of a US Senate investigation into the insurance industry. It reveals much about the aviation insurance business on both sides of the Atlantic, and we believe that the light that it throws on the part played by the London market—about which little is ever published—will be of particular interest. The following is a summary of the lengthy proceedings.

TWENTY years ago the US aviation insurance market was dominated by three groups of companies which underwrote 96 per cent of all aviation business reported to the New York State Insurance Department. These groups were Aero Insurance Underwriters Inc, Associated Aviation Underwriters Inc and United States Aviation Underwriters Inc (USAU). Profits of these groups were substantial, amounting to 25.9 per cent of premiums for all classes of aviation insurance, but airlines felt that premium rates could be reduced, and that there was no active competition between the groups. Unlike more common forms of insurance, almost all aviation insurance is underwritten through groups or syndicates, which spread the risks among a number of companies.

The three big groups in 1942 were each composed of fire and casualty insurance companies; two of these groups were composed of both British and American companies. But by 1958, when the Senate sub-committee began its investigations, there were only two groups left of those operating in 1942, in spite of the phenomenal post-war growth of air transport: these groups are the United States Aviation Insurance Group (USAIG) and Associated Aviation Underwriters. A third group, Aero Associates, a successor to Aero Insurance Underwriters, was liquidated early in 1958 and its business acquired by USAIG; the Senate sub-committee was concerned about this, and its report condemns the demise of this group as "Liquidation . . . for the purpose, among other things, of reducing competition by eliminating a young and aggressive price competitor." The report comes to the conclusion that, with only two major pools, insurance rate competition is virtually eliminated as the two markets tend to become one. The sub-committee was also concerned about any agreements or undertakings entered into by the two American groups with foreign groups "which might be in the nature of cartel-type arrangements."

The Insurers' Trade Association

The International Union of Aviation Insurers (IUAI), the world aviation insurance market's trade association, was founded over 20 years ago by British, German, Italian, French, Swedish, Dutch and Swiss insurance interests. The British Aviation Insurance Co Ltd (BAIC) is a member, like USAIG, but Lloyd's is not, although repeated attempts have been made to get them to join, and there has been a certain amount of co-operation between Lloyd's and the Union. The Senate sub-committee directed considerable attention to the American connection with the Union and "the relative influence in shaping attitudes towards insurance competition of those adhering to European cartel philosophy and those professing belief in American concepts of free enterprise." The Americans have, in fact, had to face severe competition from the London market; for instance, at the time of the hearings Capital was insured to the extent of about 84 per cent directly in the London market, and the remainder with Aero Associates. Similarly El Al, originally insured by USAIG, turned to BAIC because of the latter's lower rates, and it transpired that USAIG had been underquoted by foreign markets on Misrair, Pakistan International Airlines and Japan Air Lines.

The report is critical of the extent to which the American market has relied on foreign markets, particularly Lloyd's, for re-insurance, and cites correspondence between the BAIC and USAIG to support its suspicions that a gentleman's agreement had resulted in 1942 in which the former had kept out of the Canadian and South American aviation insurance markets in favour of the USAIG. Each group desired to respect the other's sphere of influence, a state of affairs which apparently still continues. Mr Albert J. Smith, president of USAIG, repeatedly asserted, when questioned on more recent activities of his group, that no such agreements had been made or were in existence, but to quote the report: "The documentary evidence . . . strongly supports the inference that restrictive undertakings were made in the case of the Latin American markets."

Another example of USAIG co-operating with competing foreign markets in determining rates for certain types of risks was brought to light in the matter of insuring the Boeing 707 prototype. Mr Smith testified that he had been invited by the London market to co-operate in the rating of this aircraft, had submitted a rate and this was satisfactory to London. Representatives of Lloyd's and USAIG had agreed on the rate in private. He felt that American competitive markets would not have been able to cover the whole job, and therefore it was necessary to get important segments of the market together to agree on a rate, as this would have been the only way Boeing could have obtained the insurance.

The IUAI's underwriting sub-committee, meeting at Amsterdam on October 9-10, 1957, placed before the annual meeting of the Union the question of whether the USAIG/Lloyd's agreement on the 707 prototype might not be a better proposition than several markets competitively quoting for the whole value. The Senate Report comments: "The desire to secure needed (insurance) capacity was unquestionably a compelling factor in the arrangement. However, it seems clear that an important consideration behind the arrangement was the desire to eliminate bothersome price competition." This was further emphasized by the fact that the Amsterdam meeting, when it came to consider future rating of the big jets, discussed this matter without recording the discussion in the minutes.

The Senate Report quotes a letter of January 6, 1958, from Mr Smith to Mr Langmead, secretary of the IUAI, setting forth the former's views on spreading jet risks over the entire aviation insurance market, and his uncertainty regarding how to approach the London market, and particularly Lloyd's, on the question of apportioning jet risks. "My major concern is not to have the lion's share of the business, but rather to escape a series of catastrophic losses which could well be ruinous," wrote Mr Smith. Shortly after, what was called the Respect The Lead Agreement entered into by various London aviation insurers (none of whom were members of IUAI) became effective, and ran as follows:—

"We, the undersigned Lloyd's & Co underwriters, hereby mutually agree . . . that in regard to the renewal of any insurance within the classes defined below: (1) We will respect the lead, irrespective of whether or not we have previously had an interest in such insurance and irrespective of whether we are asked to quote by the holding broker or by any other, and irrespective of whether there is any alteration in the terms. It is, however, understood that any underwriter may quote renewal terms to the holding broker or to any other when, and not before, he has obtained confirmation from the existing leader that the latter no longer wishes to retain the lead. (2) Joint consultations as to terms shall take place between at least the first three Lloyd's and the first three company underwriters."

London Puts up the Rates

The agreement, which covered only the London market, contemplated a 10 per cent increase in rates.

Mr Smith of USAIG welcomed this step taken by the London market as helping to avoid "the catastrophic consequences of a continuation of the present gravely low level of rates," and this agreement's significance in terms of co-operation where (in the Senate's view) there should have been competition between American and London markets was revealed in this comment in a letter from Mr Smith to W. de Vlaming, president of the IUAI. "In view of such (anti-trust) laws," wrote Mr Smith, "we cannot agree that we will follow the intent of the agreement. Whether we will, in fact, follow it is another matter. Certainly, I think there is little likelihood of our cutting the London lead's rate under ordinary circumstances and we certainly look upon the agreement as one step that would improve underwriting results in what has been a wildcat market at London."

Mr Smith is criticized by the Senate Report for his insistence on paying lip service to the letter of the anti-trust laws, and for making pronouncements indicating an intention sharply at variance with the spirit, and possibly the letter, of those laws. The report quotes a letter from Mr Smith to Langmead of January 6, 1958: ". . . it is dangerous from our point of view to have files show what others might use against us if we should ever have the Federal Government descend upon us under our anti-trust laws. . . . The point is we must so conduct ourselves as to be able to show that we did not engage in price-fixing to the detriment of the buyer. . . . So, we must by our actions avoid any suggestion of collusion."

The Senate sub-committee's information on the trade practices of American aviation insurers, particularly in the international field, was immediately made available to the Department of Justice which, in January 1960, summoned a grand jury in New York to consider whether the Federal anti-trust laws had been violated.

The Vickers Vanguard officially entered service with BEA last Wednesday, March 1, on the route to Paris. It may undercut Viscount flight times by 15 minutes. At a ceremony at London Airport a week beforehand, Lord Douglas of Kirtleside, BEA's chairman, was presented with a replica plaque from HMS "Vanguard" by Rear Admiral John Grant, late Rear Admiral Reserve Ships, Portsmouth. It is now installed in the tourist cabin of Vanguard G-APED

AIR COMMERCE . . .

BARBERS' POLES FOR KLM

DISCUSSIONS held between a KLM management-and-pilot team and Smiths Aviation Division at Cranfield and Bedford at the end of January (photographs of the meeting were published in *Flight*, February 10) have had a quick sequel. The airline announced last week that it has decided to buy from Smiths a Para-Visual Director. The PVD is to be installed as six units giving azimuth and pitch displays for both pilot and copilot. Installation of the display heads, pilot's controller and amplifier will be undertaken by KLM at Schiphol Airport. A three-day period of PVD crew-training is scheduled for later this month, but KLM emphasize that the system will at first be used experimentally only, to evaluate it as means of lowering weather minima. Similar installations are planned for later this year by BOAC and by Boeing in a 707, and by SAS in a DC-8.

A KLM spokesman said last week that the airline team had been "very impressed" with what Smiths had shown them. KLM were interested in auto-flare and they were working with Smiths and other British equipment manufacturers on the development of automatic landing systems. They expect that within eight years fully automatic landings will be normal airline routine. Conversion of an operational aircraft with auto-flare is no easy task, but KLM are interested in this British technique in relation to the additional jet equipment which they are known to be considering for 1962 and 1963.

MIDDLE EAST RATE WAR

ACCORDING to the chairman of Middle East Airlines, Sheikh Najib Alamuddin, a rate war is flaring up in the Middle East in which discounts are being offered of up to 50 per cent. These reductions are as substantial as anything that was offered on the South Atlantic at the height of the undercutting battle which raged there in 1959-1960.

A new twist to the passenger-fare discount which the Sheikh mentioned is the practice of ignoring excess-baggage charges; the additional weight is not shown on the passenger manifest and the aircraft could thus take-off overweight. Sales agents should not be made responsible for passenger handling, said Sheikh Najib, because it placed them in a position of being able to ignore the excess-baggage stamp to gain a sale.

Full facts and figures about undercutting are always very difficult to obtain and, in the words of MEA's chairman, "it would need an army of IATA auditors with access to airline books" to stamp it out. Even then, it is easy enough to disguise a discount. The Sheikh, who is a member of IATA's executive committee, said that covering-up was done by "putting in an item of expenditure that no one can detect."

The trouble was, he continued, that on many routes out of Beirut capacity far exceeded traffic. Difficulties arose when representatives had to meet budgets based on capacity instead of on traffic. MEA had championed the fighting of malpractices but, where a rate-cutting situation existed, "we fight enforcement all the time."

The worst route for rate-cutting in the Middle East is probably that between Beirut and Teheran, on which there are 23 services a week. Istanbul is also bad, and (said the Sheikh) cuts on indirect services to South America reached 20 per cent "as a rule." The Far East routes were fairly "clean," and fare-levels had been maintained on direct services to London. On indirect services via various points in Europe, however (Beirut - Rome, for example) fare reductions had been made to gain business; some of these were as substantial as any made anywhere.

Sheikh Najib observed that it was desirable that as much business as possible should be conducted through sales agents. "Separate airline offices are a function of suspect business," he said. He did not think that sanctions against airlines could be used to stop rate-cutting, but if the practice continued Governments would have to take a hand. IATA fines should be made *pro rata* to the network if the penalties were to be effective, and it might also be worthwhile introducing automatic endorsement of tickets—this had been done on the route to Jerusalem and had made it clean.

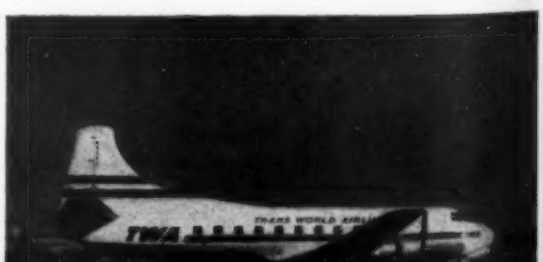
MR LAKER AND HIS FLIGHT ENGINEERS

IN a statement entitled "More Union Support for British United," Britain's largest independent declares: "Strong support has come from the Merchant Navy and Airline Officers Association [representing the flight engineers] for British United Airway's applications to run a new network of scheduled air services from Gatwick."

In a letter to Mr F. A. Laker, executive director of British United, Mr D. S. Tennant, general secretary of the MNAOA, writes: "We have always contended that there is sufficient airspace to give the independent operators ample room for expansion without necessarily coming into direct conflict with the State-operated airlines . . ." Mr Tennant's letter goes on to state that the Association will be glad to write formally to the Air Transport Licensing Board in support of British United's applications.

BALPA, the pilots' association, has also made a statement supporting the new route-applications by the independent airlines (see *Flight* last week, page 257). What British United do not mention in claiming "more union support" for BUA is that BALPA's welcome for the independents' new applications is a conditional one—the condition being that independent pilots should be paid the same as corporation pilots.

The flight engineers' union, for whom Mr Tennant speaks, apparently make no such condition. Their approach appears to be rather more enlightened than that of BALPA: they recognize that the independents will not be in a position to afford corporation pay-scales until they are in the corporations' scheduled-service league. No doubt the flight engineers will, when the time comes, press for the increases in pay which the independent pilots (who, according to another recent BALPA statement, are labouring under a sense of "gross injustice") are demanding from the start. But, until that time comes, the independents' flight engineers appear content to look forward, unconditionally, to a share in increased independent airline prosperity.



Last days of service are running-out for TWA's Martin 4-0-4s, which are to be withdrawn from operations by April 30. The aircraft shown here is at Kansas City awaiting "de-activation"

Renton Municipal Airport near Seattle, the scene of so many first flights of airlines' flagships, is again the setting for this photograph of Lufthansa's first Pratt & Whitney JT3D-1-powered Boeing 720B. The aircraft are to be used on routes to South America and the Near and Far East. A fifth Conway-powered 707-420 should be delivered this month; the airline has also bought 727s (see page 294)

SKYWAYS THIS YEAR

SLIGHTLY lower fares and increased frequencies characterize the summer coach-air services to Paris which Skyways will be operating this year. The minimum through-fare, which includes transport by coach between London and Lympne, by air to Beavais, and from there to Paris by coach, is still controlled by agreement with British and French Railways at £8 10s return. The lowest rail-boat-rail fare, available only at restricted periods, is one shilling less—£8 9s, although it might be argued (by Skyways it *is* argued) that the standard of rail service, particularly in terms of elapsed time, is lower. Given their choice, Skyways might set their lowest through-fare, as they attempted to do last year, at about £7 5s.

Skyways claim that last year about 100,000 people travelled to Paris at their lowest through-fare. Minimum fares apply on Mondays to Thursdays inclusive this year, and for the early morning (0630hr) departure from London at weekends. Peak return fare, applying over most departure times on Fridays, Saturdays and Sundays, is ten guineas; Skyways make the point that there are no coach fares or airport charges to be added. Peak fares are five shillings lower than those charged last summer.

Frequencies on the through service should be greater this year than in 1960, although the maximum authorized limit of 21 return services cannot, of course, be exceeded. Minimum summer frequency between April 1 and October 31 will be four return services a day, but this year there should be many more relief services than formerly. It is said that bookings are already heavy and that over the Easter week about 5,000 passengers will be carried—this is 25 per cent more than last year.

Weekly seasonal excursions to Vichy and Montpellier, Lyons and Tours will continue.

CAB v. THE REST

LATEST American move to protect their airlines' international traffic (see "The Americans Get Tough," *Flight*, February 17, pages 223-224) has met with strong protests from the UK and other European countries. These include Sweden, Norway, Denmark, the Netherlands, Belgium, Switzerland and Spain. Protests have also come from Brazil, Mexico and Chile.

The CAB's threatened "pre-hearing conference," held on February 23, was intended to "establish procedure" for dealing with the complaints which the Americans obviously expected. As a matter of history, the original CAB order requiring foreign airlines to file with the Board full details of their future schedules and past traffic results was dated January 18, two days before the end of the Eisenhower Administration. It was not served on foreign airlines (via US embassies) until January 24.

It is understood that a number of foreign embassies in Washington, including that of the UK, have expressed their dismay over what has been described as "an attempt to contravene the various bilateral air agreements between the United States and foreign countries." Surprisingly, it appears that the CAB's action was taken without prior State Department approval. The Board is now saying that it will not push its proposals too fast or too hard "until some of the diplomatic implications have been straightened out."

The airlines operating into the United States feel that the CAB is attempting to impose upon them what the Americans have always deplored in others—the control of the capacity and frequency of schedules, which is in direct breach of the spirit and principles of the 50-odd Bermuda-type agreements made between the USA and foreign countries.

TWO POOLS IN AFRICA

THOUGH there may be little or no competition within a pool, such an arrangement among airlines is often a measure to form a bloc of kindred interests against other common interests. In Africa, for example, competition between the British (and British Commonwealth) and French carriers is sharpening.

The Springbok partnership—SAA, BOAC, CAA, EAAC and BUA—is all set for a big increase in traffic this year. From April 1, the partnership will have 13 jet flights a week from Johannesburg to London. From April 4, SAA is introducing a 707 from Jan Smuts airport every Tuesday to compete with UAT's DC-8 flight leaving the airport at the same time. SAA will have two stops—Brazzaville and Rome on their 707 service to Paris—and UAT will have three—Salisbury, Elisabethville and Brazzaville.

The French airlines are as active as the British and British Commonwealth operators in their efforts to protect their markets against competition. Apart from UAT's *coup* in getting rights in Elisabethville (formerly a Sabena monopoly) the three international French lines—Air France, UAT and TAI—are all in pool on the African services which they operate, like the British pool partners, to a joint timetable.

VOICE OF THE NON-STATE AIRPORTS

IT might have been expected that the annual dinner of the Aerodrome Owners Association would have been an occasion for the expression of lively views by this "mouthpiece of the owners of all the non-State controlled aerodromes throughout the country." After all, the State's record as an airport owner has never been so controversial as it is today—with Ministry landing charges going up again, BEA (and indeed all the airlines) criticizing the Minister publicly for the first time in history, a Parliamentary Select Committee taking evidence from them, and so on. But although the eight after-dinner speeches and stories went on for nearly an hour and a half, there was scarcely a passing reference to any of these big issues by the three AOA speakers.

Mr Peter Masefield, one of the guest speakers, did have some worthwhile things to say. The growth of aviation in this country, he thought, was limited only by the number of airports—"We must have a hundred more aerodrome owners in the next five years if we were going to be an air-faring nation of consequence." He was glad to see Sir Laurence Sinclair present. As the Ministry's new Controller of Ground Services, Sir Laurence was, for the first time in the Ministry for many years, "a real aviation man." At last we had "a Brancker type of chap in the Ministry, and no one could say more than that." Mr Masefield hoped he was "not being too beastly" describing the Ministry as

(*Concluded on page 296*)

Since July 1958 this office block has been part of BEA's engineering base at London Airport, but from early April it will serve as temporary passenger and office accommodation at East Fortune Airport, twenty miles from Edinburgh. BEA are moving there from Turnhouse this summer while Edinburgh's runways are strengthened in preparation for the airline's new Vanguards

This was the scene at Miami International Airport last week, when every gate position was filled by strike-stricken airliners. The scene was typical of that at all major US airports. A note on the strike appears on the opposite page

AIR COMMERCE . . .

BOEING 727s FOR LUFTHANSA—

AT the moment, Lufthansa's order for 12 Boeing 727s is more of an intention to buy than a firm contract, but the intention is significant for two reasons: (1) The German airline has now stepped further out of line with its Air Union partners Air France, Sabena and Alitalia, all of whom have chosen Caravelles as their short-range jet. The German airline first dashed Air Union "common re-equipment" hopes when it bought Boeing 720s last year; (2) The first round in the competition for export orders among the DH Trident, the VC11 (in which Lufthansa are believed to have been seriously interested) and the Boeing 727 goes, within two months of Boeing's announcement of the 727, to Boeing. Eastern and United ordered 40 each last December.

It is assumed that Lufthansa intend to employ the 727, as BEA intend to use the smaller DH Trident, as their prime vehicle for intra-European operations. The provisional order would be worth about £20 million with spares.

—AND THE BOEING 747

A STORY in *The Sunday Telegraph* last week that Sir George Edwards, executive director of the British Aircraft Corporation, has been in the United States discussing the future of the VC11 and the BAC-107 with Boeing appears to have been more speculative than factual. In fact, Sir George did not talk to Boeing during his recent visit to North America.

The story (which was followed up by the *Daily Herald*) was to the effect that BAC would drop the VC11 if Boeing would drop their 747 project, which is in the BAC-107 class.

It is soon to be decided by BAC whether to proceed with the VC11 or the BAC-107, or both. It is possible that the Lufthansa decision to go for the Boeing 727, and mounting market interest in the smaller type of jet airliner, may well tip an "either/or" decision in favour of the BAC-107.

THE LORDS DEBATE AIRPORTS

NOT much that was new came out of the Lords debate on "London Region Air Traffic" on February 23, which engaged the upper chamber for a little over three hours. Nevertheless, as in the case of their lordships' recent debate on jet fuel, the discussions were a useful review of a controversial subject, and it was evident that most peers had—as in the case of the jet fuel debate—taken the trouble to do their homework.

Pressed to say why the new intercontinental terminal at London Central is not to have the finger-and-gate system immediately, Lord Mills, for the Government, said that some aircraft would probably be served by such piers "and more remote stands will be served by some form of vehicle". (This is the first official hint of the possibility of the introduction in London of the mobile-lounge idea being adopted at Washington.)

Lord Mills would not be drawn on the subject of an independent authority for the management of London's airports; but on the subject of a monorail link between the airport and the city, he said: "It would be an attraction to the Government if any such project was financed by private money and was not a burden on public funds."

Fokker's oft-repeated contention that a high wing confers safety seems to be borne out in this photograph of a Piedmont Airlines F-27 after landing with one mainwheel leg up at Seymour-Johnson Air Force Base, N. Carolina. Propellers, wings and fuel tanks remain untouched

It is as well to clear up doubts evident in the debate about the utilization of London Airport. According to Lord Shackleton, "Some figures were published in *Flight* which suggested that the number of movements at London area aerodromes had declined by 18 per cent between 1958 and 1959; the exact figures were 210,000 compared with 258,000." Lord Shackleton thought this suggested that London's air space was not necessarily getting more crowded. In reply, however, Lord Mills said that "aircraft movements were up in the London area by 3,000 between 1958 and 1959, and 14,000 between 1959 and 1960". The facts as published by the Ministry of Aviation, and as reviewed on December 2, page 890 ("How Crowded Is London's Air Space?"), are that the total number of movements at London area airports in 1959 was 210,986 compared with 258,318 in 1958. We suggested that the explanation "is probably that general aviation and private flying are drifting away from Britain's capital". It is not yet possible to give figures for the year 1960, since these have not yet been published by the Ministry of Aviation; but it will be of interest to see whether in fact, as stated by Lord Mills, the trend was reversed last year.

NEAR MISS NEAR HEATHROW

THOUGH a near miss seldom rates big headlines, except perhaps when the Queen is involved, the anxiety it arouses should technically be no less great than if the near miss were actually a collision. This is particularly so when two jet airliners fly within "a few hundred feet" of each other in the London control zone. This happened on February 21 when the commander of a UAA Comet 4C inbound from Cairo reported a near miss whilst he was three miles from Epsom in the circuit for runway 10L. The subject of the Egyptian pilot's violation report proved to be a TCA DC-8 which had taken off from runway 10L and which was outbound for Montreal. The UAA Comet 4C had six passengers on board, and the DC-8 was carrying 81 passengers.

The incident immediately became the subject of an investigation which, when *Flight* inquired of the Ministry last Tuesday morning (seven days after the incident) was "still not completed". Neither of the two airlines was willing to comment, and the only statement was attributed to the TCA commander, Capt Roger Smith, who said: "I had clear visibility on all sides but I never saw the Comet." Another report attributed to TCA was to the effect that the pilot may have missed an ATC instruction whilst changing frequency.

Asked whether the findings of the investigation would be published when it was completed, a Ministry spokesman said: "It is not normally the practice to publish the findings of this type of investigation."

QUICKER BY ROAD

WHILE Silver City's *entente* with French Railways has recently become closer, the part played by British Railways in joint rail-air services will this summer diminish. From June 23 until September 18 the Silver Arrow service will operate from Lydd instead of Manston, and a coach link between London and Lydd will replace the rail journey to Ramsgate and the coach journey from there to Manston. The service on French soil will continue to be provided by French Railways' express diesel railcars.

With the changed character of the Silver Arrow service all-the-week return fares have been reduced from £9 9s to £8 15s return, and overall journey time has been slightly reduced from 6hr 43min to 6hr 25min. Between Lydd and Le Touquet the service will be operated by Silver City's Hermes or by DC-3s.

Whatever factors may have been responsible for the airline changing the pattern of the Silver Arrow service, it now seems

clear that construction of the Manston rail spur, which a year ago seemed such a promising complement to the rail spur on the other side of the Channel, cannot be implemented for some time to come. From any point of view rail-air collaboration in Great Britain appears to have taken a backwards step.

THE BIG STANDSTILL

NO principle is more resolutely defended by flight engineers than the one that the engineer in the cockpit should be regarded as a specialist in a particular craft; even when he is also trained as a pilot the engineers believe the third (or fourth) man should first and foremost be an engineer. So when the US National Mediation Board, after studying for over a year 5,000 pages of testimony on separate representation for United Air Lines flight engineers, decided in January that all flight-deck crew should have common representation, the engineers believed their own bargaining position to be seriously weakened. The Board's ruling was widely interpreted as meaning that flight engineers were required to become members of the Air Line Pilots Association, although this was denied by ALPA as "completely untrue and irresponsible". The pilots also denied the contention that collective bargaining alongside the pilots meant that engineers' jobs, seniority and salaries would eventually be threatened.

The result of the Board's finding was the strike of 3,500 US flight engineers, which last week crippled US airlines' overseas services and severely curtailed domestic flights. In the six days between February 17 and February 22, the airline industry lost about £5 million a day in revenue, cancelled 700 flights a day, and laid-off or prepared to lay-off about 84,000 employees. By the fourth day TWA, Eastern and American were at a complete standstill. A curious feature of this turbulent period was that although the strike was directed against seven major airlines—PanAm, TWA, American, National, Eastern, Flying Tiger and Western—the Flight Engineers International Association did not strike against United, the operator most directly involved. Since 1956 this airline has accepted only pilot-qualified engineers, and only 17 of the airlines' engineers do not now possess a pilot's certificate.

The direct intervention of President Kennedy was required before the strike was called off. He promised through Mr Arthur Goldberg, US Secretary of Labour, to set up a three-man fact-finding commission to study the engineers' complaints. Six airlines agreed to re-accept their engineers without disciplinary action, but Western announced that it had discharged its 130 engineers and would use pilots in their place.

ORLY'S NEW TERMINAL

THE great new passenger terminal at Paris Orly, officially inaugurated by President de Gaulle last Friday, will go smoothly into operation overnight next Wednesday and will rightly be the pride of Paris airport. It is a great steel, glass and stone building bridging the dual carriageway of the southbound Route Nationale 7, which provides a ten-minute motor link with central Paris. A west finger (completed) and east finger (to be completed next year) will provide a total frontage of 2,240ft giving direct access to 24 aircraft parking positions. Roadways lead up from RN 7 to the main entrance hall, where passengers will go directly to their airline desk, check-in and clear Customs in one operation and leave their luggage. Conveyors will then take the luggage through to a transversal roadway giving access to all 24 gateways.

The passengers, with their friends, go up to the first floor to a large hall overlooking the apron and equipped with shops and a large electronic departures board. Back-projection of punched paper tape is used. Internal passengers then have direct access to the non-Customs side of the fingers. International passengers move through an immigration/Customs "frontier" and either direct to gates or into the transit area on the second floor. Here there are duty-free shops, a 350-seat cinema and an 18-room transit hotel. There is even an all-denominational church, divided by a glass screen to separate those who have and those who have not cleared Customs. Arriving passengers follow this process in reverse and collect their baggage on the ground floor via special "smooth-flow" Customs gates. Customs officers are given comfortable working conditions which encourage them to maintain a smooth flow of passengers.

VIP reception rooms are provided, together with a conference room and a "press club" with full telephone, film and TV facilities. There are nurseries, bathrooms and sick bay. The intention is that all checking-in and -out should be completed at Orly, leaving the Invalides town terminal only as a booking centre and pick-up point for a bus service with 15-minute intervals.

The third floor is given over to a series of restaurants, indoor and outdoor, for visitors and travellers. A 48-room hotel designed for day or night occupation with bathroom, television and special decor in each room is on the fourth floor; and airport and airline offices occupy the remainder of the main terminal.

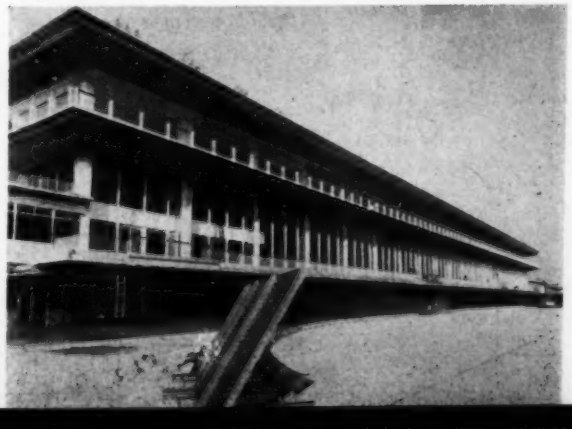
Total floor area of the new building is about 1,000,000sq ft, making it the largest built in France since Louis XIV's Invalides Palace. Most of the walling is 0.7in-thick glass and extensive sound-proofing effectively excludes aircraft noise. The whole volume is air-conditioned at twice the normal flow-rate and is slightly pressurized to keep out fumes. Decoration is mainly in stone, aluminium and stainless steel, the basic design providing almost all decoration, with little need for additional trimmings. Entirely new colours and specially woven fabrics and carpets have been supplied by the major French producers, and furniture has been specially chosen for functional comfort as well as design. The departure hall is cheerfully and brightly decorated, while the transit area is restful and luxurious. Great roof areas form observation platforms, and also have ornamental gardens.

The basic steel frame, resting on its two-storey ferro-concrete substructure, is stressed to accommodate two additional storeys and the main airfield control tower will later be moved in. There is parking for some 2,000 cars now and more than 1,000 additional places are scheduled. Loading bays in the lower basement give direct separate access to RN 7. All electrical supplies, heating and lighting are controlled from special rooms which have glass walls to allow visitors to watch operations. A central movements tote board is kept up to date by a special staff and the largest closed-circuit TV complex in Europe feeds the information out to more than 200 users. An induction-loop radio system can contact 400 key staff and 2,000 loudspeakers form the "whisper system" for passenger announcements. Air and ground controllers sitting in a tall watch-tower on the airfield co-ordinate all apron aircraft movements in conjunction with air and ground staff and operators.

The central arrival and departure board has small outstations at strategic points to keep moving passengers informed, and many white "courtesy telephones" facilitate free enquiries direct to a central communications centre. There are 21 escalators, 11 lifts, six freight lifts and a medical lift. Complete canteens and shopping centre, dispensary and other facilities are provided separately for the staff.

Personnel have been under training for four months so that the over-night move will be smooth and cause no interruption of passenger services.

The new Paris Orly terminal with its western finger in the foreground has main access from the Route Nationale 7, which passes beneath the building and apron. Permanent blast fences are on the apron itself. Most of the walls are of 0.7in-thick, soundproofing glass. The main passenger hall (right) is on the first floor, with the restaurants along the lower balcony. The roof provides ample observation platforms



AIR COMMERCE . . .

VOICE OF THE NON-STATE AIRPORTS

(continued from page 293)

"a shutter of aerodromes, a prosecutor of fliers, and a raiser of landing fees." He thought that the Ministry had a big public-relations job on its hands to change this general conception of its outlook. The Ministry did not fight hard enough to cut airport costs and to make flying less difficult. Britain was "right on the eve of a tremendous upsurge in aviation," and the air belonged to all, and not just to the corporations, professional airline pilots or any other sectional interest. Since the British Business Aircraft Owners Association was formed recently, 90 companies had declared their intention of joining and "I am convinced that 200 business houses will become members of that Association."

We needed a new philosophy: free airspace below controlled airspace. This was a "tremendously important philosophy," already embraced by the Americans and the French*, and it was "essential to the future of aviation in this country."

He thought that IFR stood for Isolation From Reality, and he wanted to see free air space up to 2,000ft except perhaps within five miles of airports. A Council should be formed to represent the interests of all British aviation bodies concerned, because the many sectional interests did not always speak in unison.

In reply, Sir Laurence Sinclair of the MoA said that he was glad to see so thoroughly responsible a person as Mr Masefield championing the cause of freedom of the air, which was a subject in which his own sentiments and interests lay. The Ministry was "genuinely attacking the problem in a most energetic manner," though it was out of place for him to say how this was to be done—it was "an immensely difficult problem." He was, he said, anxious to do everything he could to encourage private flying, though the up-and-coming generation must learn not to fly as happy-go-luckily as his generation had flown before the war. He could see no reason why the executive type of aircraft should not be allowed to fly near cities, and there was "no difficulty about the fully instrumented aircraft with the professional pilot;" the problem was with the less experienced pilot. "I secretly agree," he said, "that IFR is not a good expression," but we had to have IFR in controlled airspace. Visual evasion was a thing of the past, and if you tried to mix IFR and VFR you were courting disaster. Hence he believed it was right to go for permanent IFR in controlled airspace. It should be possible "to extend the ATC system downwards a few years hence." Plans were being implemented to get the whole of our ATC systems working together everywhere. He had recently been in the USA and he was convinced that our systems were as advanced as any in the world, and that our ATC officers were "absolutely unrivalled anywhere."

After the speeches, a film was presented by Railplanes Ltd, UK representatives of the French monorail-manufacturing company.

Footnote: Not represented at the AOA's annual dinner was the airport which is generally regarded as one of Britain's most successful and profitable non-State airports—Southend. The reason, presumably, is that Southend Airport decided last November "to take no further part in the affairs of the Association." The decision followed "disagreements which had arisen from time to time" between the AOA and Southend Airport, in particular with regard to eligibility for the office of vice-chairman or chairman of the Association. According to the minutes of the airport committee meeting held on November 16, 1960, and approved by the Southend-on-Sea Council on December 1, "there appeared to be little, if any, advantage to be gained by continuing membership of the Aerodrome Owners Association."

**See "Flight" last week, "Partnership of the Skies," page 262.*

BREVITIES

A third Twin Pioneer for delivery this year has been ordered by de Kroonduif. It will be used on services based on Biak, New Guinea.

Under a mandatory order from the FAA the fuel vents on all Lockheed 1649As must be modified to prevent cross-flow producing a dangerously lean fuel-vapour mixture.

BOAC opened at Kloten Airport, Zurich, last Monday the first of six new European cargo reservation offices. Cargo, sales and general handling will continue to be dealt with on behalf of BOAC by Swissair.

Increased BEA capacity on the routes to Glasgow and Edinburgh this year will result in 6,700 seats a week being offered to and from Edinburgh and 10,500 to and from Glasgow.

Wahn Airport, between Bonn and Cologne, will be opened to big jets this month or next, when a new runway is completed. Improvements to the airport, which include new passenger buildings, are likely to cost nearly £6 million.

Elwood R. Quesada, former administrator of the Federal Aviation Agency, has joined the board of American Airlines. Another new director is Mr James H. Edwards, secretary of the Air Force from 1957 until the new administration took over.

Japan Air Lines is likely to purchase an additional two Convair 880-22Ms for use in SE Asia. Reported price is $4,250,000 per aircraft. Delivery would follow the three already on order, which are expected to be received in May and June this year.

The Guild of Air Pilots and Air Navigators are hosts at a lecture at the Institution of Mechanical Engineers on March 28 at 6.45 p.m., when Dr A. E. Russell, director and chief engineer, Bristol Aircraft, will read a paper entitled "Supersonic Transport." Tickets are available from the Guild at 14 South Street, London W1.

Following the recommendations of a CAB examiner, Riddle Airlines are likely to receive a government subsidy, the first for a US all-cargo airline.

Aldergrove RAF station may become the new civil airport for Northern Ireland if a £500,000 project for extension and improvements is approved by the Ministry of Aviation.

Activities of the Air Transport Advisory Council are to cease on March 30 and the Council will come to an end on July 31, 1961. The first ATLB hearing is expected to be held about the middle of this month.

Presumably as a result of the collision over New York, the FAA have made it mandatory for aircraft commanders to report immediately to air traffic control the malfunction of any navigational or air/ground communication equipment. This includes VOR, TACAN, ADF or ILS.

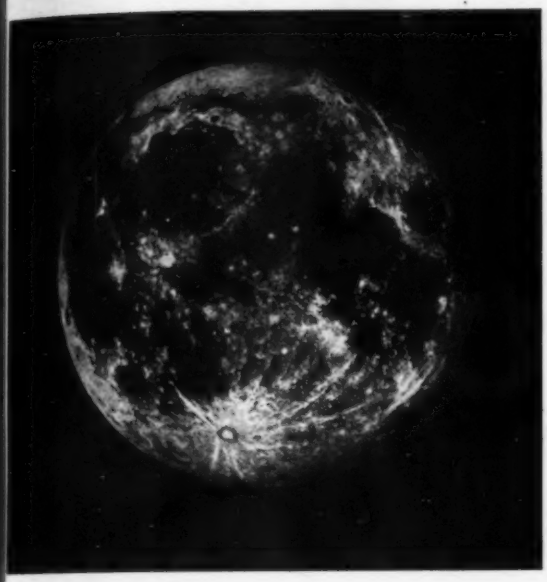
Following reports of defective bolts in the undercarriages of US-manufactured F-27s all Australian Friendships were recently grounded, but they were later cleared after precautionary checks and replacement of defective bolts.

Latest applications made to the Air Transport Licensing Board include requests from Silver City to operate to Lisbon or Madeira from Manston, Hurn or Gatwick; from BEA to operate to Madeira from Heathrow or Gatwick; and from Channel Air Bridge and East Anglian for a joint coach-air service between London and Southend.

A meeting is to be held on March 22 between the London Airport Standing Consultative Committee and representatives of Local Residents Associations to discuss grievances about aircraft noise. Sir John Briscoe, assistant airport commandant, has said that about 40 complaints were received during January. "Jets belonging to two airlines are still allowed to leave late at night," he is reported to have said, "because full utilization of aircraft brings down fares."

Two jet airliners, ten jet engines: both the Douglas DC-8 (left) and the Boeing 707 (right) are cleared for operation with a "fifth pod." The aerodynamics of these big jets have made it possible, for the first time, for airlines to reduce the number of expensive spare engines held down the route by enabling quick delivery to be made of spares from stock. This DC-8 belongs to SAS (JT4s), the 707 to Air-India (Conways)

Beyond our skies



The Moon

The moon is large as a satellite, with a volume one fiftieth that of the earth, and it might almost be called a fifth planet forming a sub-system in the solar system. Research has shown that the moon has little or no atmosphere, for its reflective capacity or 'albedo' is low: it reflects only seven per cent of the sunlight it receives. Hence the absence of blue skies on the moon, but a 'daytime' in which the stars are visible together with a blazing sun in the black firmament.

We have become familiar with "artists' impressions" of the lunar landscape. The surface seems to be composed of porous rock, possibly pumice, and covered in volcanic ash. It has been maintained that remnants of an atmosphere exist in the deeper declivities, and certain surface changes which seem to indicate vegetation would bear this out.

Craggy, dusty, airless—but for mankind distance has lent enchantment to the moon. She has smiled benignly on happy lovers, she has brought mariners home on the tide, she has inspired poetry and music, and to bat, badger and beetle and their like our 'lesser light' is the great queen of the heavens.

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